JULY, 1960

Plant Engineering

IN THIS ISSUE

Glass Cloth, Resin Give Tank a Tough Inner Coat 100
Squeezing Power Costs—
How To Get Top Efficiency from Power System 102
Test Cell Construction Reduces Engine Noise 108
Correlated Handling—
Variety of Equipment Aids Assembly 110
Should You Air Condition?
Three-Step Approach Provides Answer 113
How To Calculate Insulation for Underground Lines 117
Watch Out for Those Construction Extras 120
Solar-Powered Transmitter
Monitors Distant Processes 122
Solutions for In-Plant Vibration Problems 126
Emergency Shutoff Valves—
Tips and Actuation Methods 128
Space Frame Roof System Speeds Erection 131
Modular Knockdowns Cut Repair Parts Damage 132
Plant Floors Can Be Beautiful—
Western Electric's Formula Proves It 137
White Paint Cuts Lighting Costs 140
Pre-planning for Industrial Emergencies—
III. What We Learned from Planning and Training 143
Plant Engineers' Activities 149
How to Design Pneumatic-Hydraulic Systems—
VIII. Moving Workpince Using Hydraulic Control 154

REGULAR DEPARTMENTS

'Round About With the Editors 2
Bulletins and Catalogs 25
Backtalk and Forethoughts 34
Plant Engineers' Digest 44
Operation and Production 64
Construction Briefs 87
What's Just Ahead in This Issue? 99
New Plant Construction 162
News from the Plants 166
New Products and Processes 206
Review of New Books 242
Data File of Commercial Literature 250
Advertisers' Index 277

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Volume 14, No. 7 Circulation of this issue 51,870

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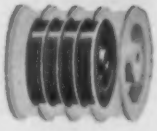

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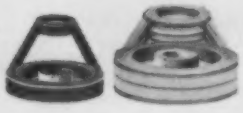

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Plant Engineer Promoted

Roland V. Fisch has been appointed vice president in charge of manufacturing and engineering for The Ohio Rubber Company, Willoughby, Ohio. He will succeed **Raymond A. Mertz,** who is retiring.

Fisch began his career with the company in 1946 as a machine designer. After a year he was made plant engineer at the company's Conneautville, Pa., plant and in 1949 was named maintenance superintendent for the Willoughby plant. In 1952 he was made plant engineer there and in 1957 was appointed director of engineering, the post he held until his recent promotion.

He is a member of the American Institute of Plant Engineers; American Society of Mechanical Engineers; National Management Association; and the American Ordnance Association.

He graduated from Ohio State University with a degree in Mechanical Engineering and has attended Cornell University's Graduate School of Business Administration.

September Conferences, Shows

MACHINE TOOL Exposition—will take place at the International Amphitheatre, Chicago, from September 6 to the 16. It will be held concurrently with the Production Engineering Show, which will be held at Navy Pier. Further information may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York 17, N. Y.

Bakery Equipment Maintenance—six-day maintenance short course will be held in Chicago from September 12 through the 17. Plant engineers and personnel concerned with bakery equipment maintenance will learn about the analysis, scheduling and organization of a preventive maintenance system for this equipment. For more information, write to American Institute of Baking, 400 E. Ontario St., Chicago 11, Illinois.

American Welding Society—fall meeting will be held in the Penn-Sheraton Hotel, Pittsburgh, Pa., from September 26 through the 29. A total of 51 technical papers will be presented at the 17 sessions planned. More information is available from the American Welding Society, 33 W. 39th St., New York.

Association of Iron and Steel Engineers Exposition and Convention—will be held at Cleveland Auditorium, from September 27 through the 30. There will be a total of 42 papers presented at the conference sessions. More information is available from Association of Iron & Steel Engineers, 1010 Empire Building, Pittsburgh 22, Pa.

Engineering Promotion

W. H. Owens has been appointed division staff engineer of The Philip Carey Manufacturing Company, Cincinnati, Ohio.

Prior to receiving his present appointment, he served as chief engineer and manager of product development with other rock wool insulation manufacturers since 1951. Before then, he was with Carey for seven years as plant engineer, staff engineer, chief engineer and division manufacturing manager.

Mr. Owens is a native of Ontario, Canada, and was graduated from the University of Toronto with a Bachelor and Master degree.

Maintenance Training Seminar?

A DINNER MEETING was held at the Palmer House, Chicago, on the evening of April 12 to discuss the problem of training maintenance men for work with highly automated and controlled equipment. Attending were Bion Hutchins, Ninth Naval District; Charles Swikert, All-Steel Equipment Co.; Louis Plassmeyer, Phillips Mfg. Co.; George Walters, Caterpillar Tractor Co.; Walter Nowacki, Kroger Co.; Raymond Podboy, American Steel & Wire Co.; Joseph Kucho, Link-Belt Co.; Raymond E. Roehrick, Combustion Engineering Inc.; Dick Morris, Editorial Director, Tom Hanson, Ed-

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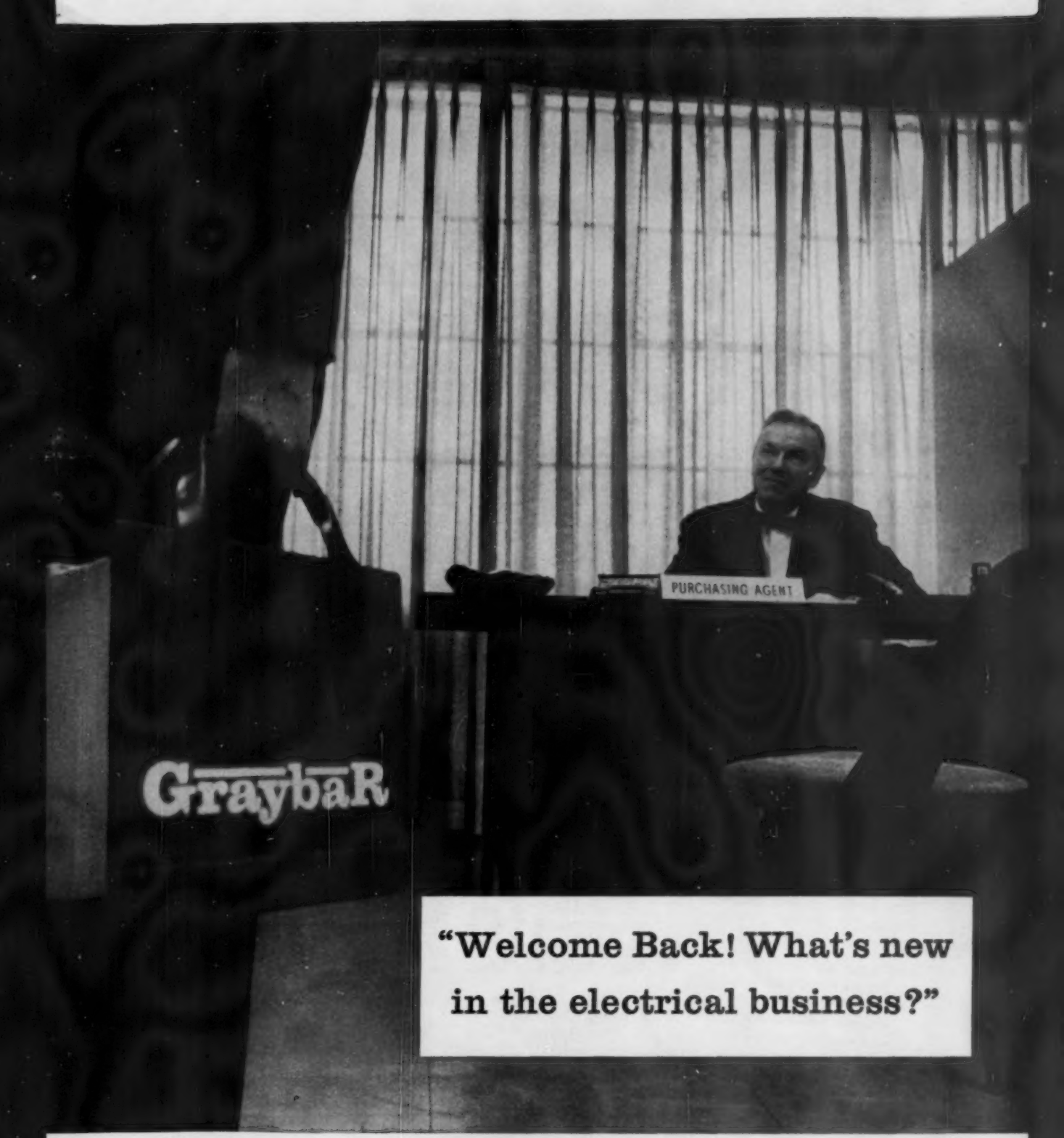

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'ROUND ABOUT

itor, and Vern Kempf, Electrical Editor, all of PLANT ENGINEERING.

Following a two-hour discussion on problems faced by plant engineers in the training of maintenance workers, it was decided to more fully explore the possibilities of holding maintenance training seminars later in the year. The entire problem will, in the meantime, be placed under close scrutiny to determine what approaches are needed to effect changes in worker, management and union attitudes. Other problems requiring study lie in the areas of who should be trained, how to select trainees on the basis of favorable attitude, abilities and age, and how to determine cost and value of such training in order to enlist management's aid in the programs.

Notice to All Readers! Polyurethane Photo Credit

THE EDITORS of PLANT ENGINEERING have been informed by J. D. Hershey, Director of Public Relations, Dayco Corporation, Dayton, Ohio, that we committed a sin of omission in the article, "Polyurethane—Modern Tool" which appeared in the September, 1959 issue. Mr. Hershey states, in effect, "... the photos were bought and paid for by our wholly-owned division, American Latex Products Corporation, Hawthorne, Calif."

We were not aware of this at the time of publication but we want to set the record straight. The photos were contracted for and paid for by American Latex Products Corporation and depict this company's polyurethane (Stafoam) in use.

Piping Analysis Service

A COMPUTOR service that produces a piping flexibility analysis within 48 hours is now available from The Service Bureau Corporation, a nationwide subsidiary of IBM. If needed, an analysis can be provided within a few hours.

Here is how the service works: Clients prepare a simple description of their piping system on data sheets and send it for analysis. The information is then placed on IBM cards and put through the computer process.

Final reports include anchor and restraint reactions, forces, moments of stresses at all intermediate points as well as displacements and rotations.

Tangents, bends, and closed loops in any combination having any orientation are permissible. Changes to a system are easily specified since coordinates are not used in the input data.

For further information about this service, write to: The Service Bureau Corporation, 425 Park Ave., New York 22, N. Y.

Retirement—Appointment at Keasbey & Mattison Co.

Earl L. Kunkle, plant engineer, in Keasbey & Mattison Company's Asbestos-Cement Pipe Manufacturing plant, Ambler, Pennsylvania, retired after serving with the company in a number of positions since 1945. Prior to his association with the company he was employed by General Motors Corporation, Ternstedt Division, West Trenton, New Jersey.

E. L. Kunkle

C. D. French

He spent the war years as an Army-attached civilian engineer, supervising utilities installations at U. S. Air Bases under construction in the West Indies. Earlier, he was distribution engineer for the Pennsylvania Power & Light Company, Allentown, Pa.

Charles D. French has been appointed to take over his duties as plant engineer. He was named assistant plant engineer in November 1959; and took over the duties of plant engineer as of April 1, 1960.

Pallet Rack Nomenclature

IN THE PAST there has been some confusion between the ultimate user of pallet racks and his prime supplier because there was no standard nomenclature for pallet racks.

However, to correct this situation The Rack Manufacturer's Institute has established a standard nomenclature so that a specific word means a specific thing. With the use of this terminology, the ultimate consumer will be able to compare specifications or one quotation with another.

If you would like to receive additional information about this standard nomenclature for pallet racks, contact the Rack Manufacturer's Institute, P. O. Box 550, Norristown, Pa.

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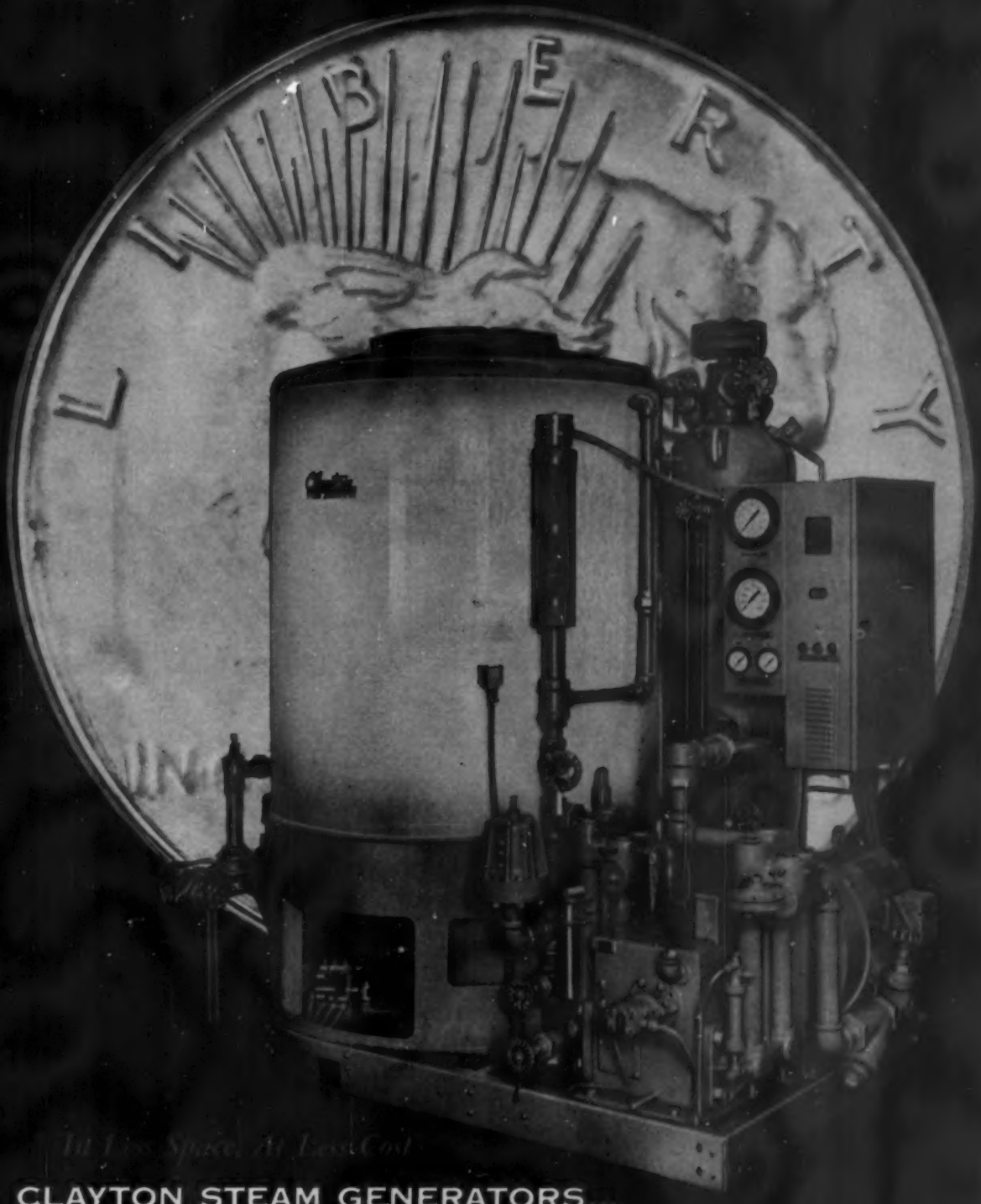
STEAM THE MODERN WAY



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—WHAT ABOUT MAINTENANCE?

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Plant Engineer
ST. REGIS PAPER COMPANY
Jacksonville, Florida

"Here at ST. REGIS, ours is the specialist's approach to paper making. We know exactly what it takes to make quality Seminole Kraft Linerboard. It has been our business for years.

"It's the same with our OTIS Elevators. We have three of them. Two are used primarily as passenger elevators but they also handle light freight. The third, and most critical, is a 30,000 pound duty OTIS Hydraulic Freight Elevator. It is used to keep our finished output moving. Shutdowns would be costly.

"As specialists in maintaining paper making machines, we decided from the start that the OTIS specialist's approach to elevator maintenance was the best way to keep our elevators running. We have been well satisfied with our choice since 1953."

What is the OTIS specialist's approach to elevator maintenance?

It is MEN . . . MATERIALS . . . METHODS.

MEN: Elevator maintenance is no one-man job. It is an organization task requiring experts in many lines. No individual, even if he devoted his entire time to the job, could do it properly. It calls for men with an unusual combination of skills plus long training in studying parts, assemblies, functions, replacement procedures, testing and adjusting.

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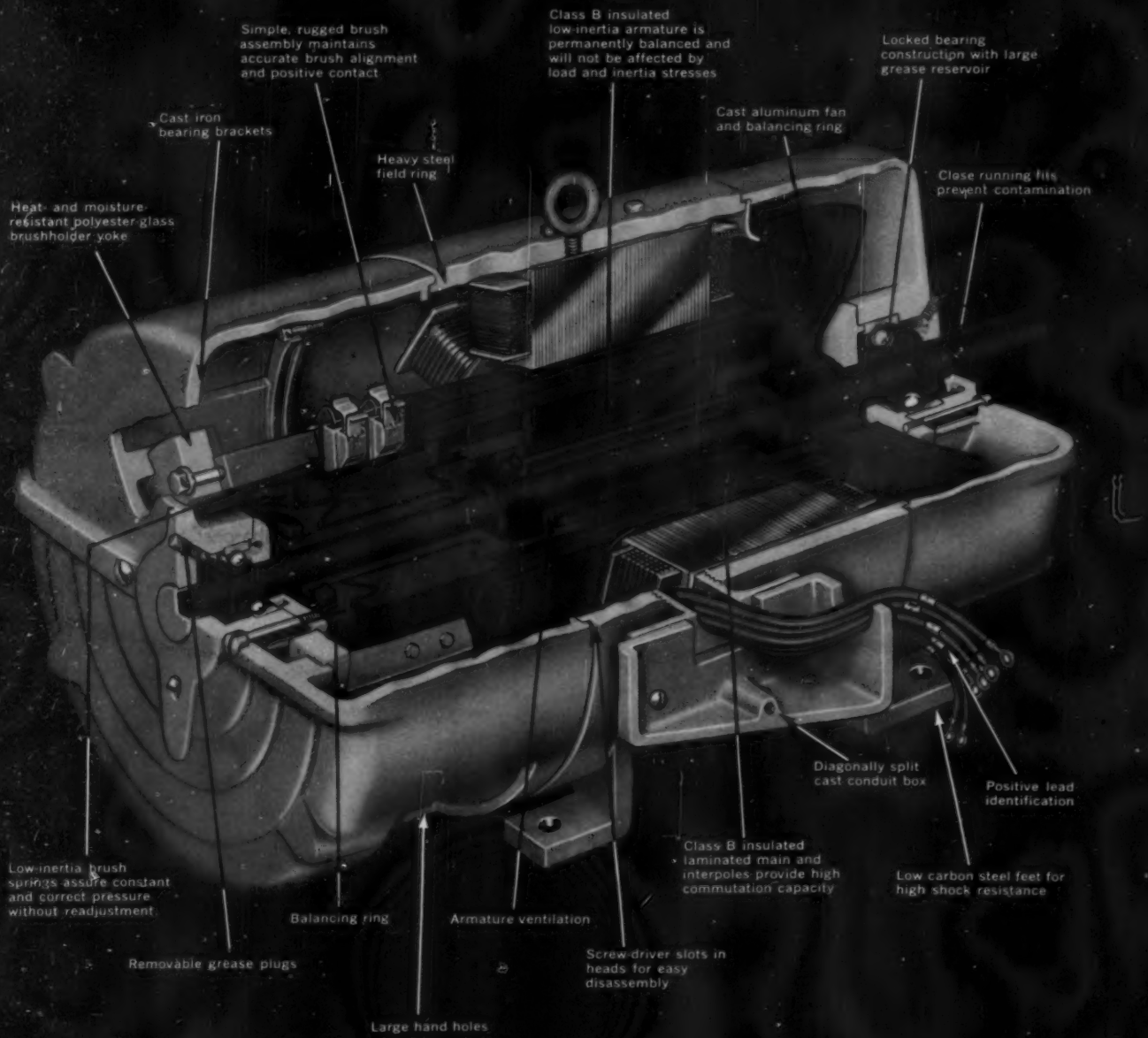
PLEXITORQ sets new standards for d-c motor performance

Here's the latest in D-C motor design:


Simple, rugged brush assembly maintains accurate brush alignment and positive contact
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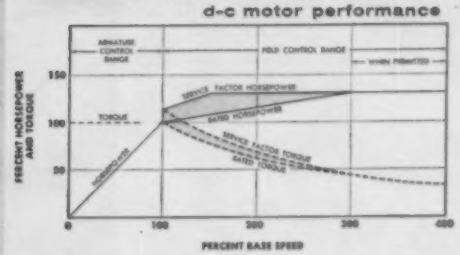
Magnetic disc-type brake with d-c series or shunt, or a-c coils

Another new product from Louis Allis

FLEXITORQ sets new standards for d-c motor performance



LOUIS ALLIS FLEXITORQ MOTORS

- are rated 60° C rise for continuous operation
- provide 1.15 service factor operating at base speed, and 1.30 service factor at 150% to 300% speed
- may be operated from 300% to 400% of base speed at 130% load with 1.0 service factor, where size permits
- short-time overloads of 400% can be commutated at base speed and below

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The new Louis Allis Flexitorq is lighter and more compact than previous d-c motors . . . lets you squeeze more power into less space . . . yet is actually *easier* to service! Brushes and entire brush-holder assemblies can be quickly inspected and removed without major disassembly. And since brush springs remain conveniently attached to the brush holders, brush changing is a simple affair.

Flexitorq d-c motors are available in sizes from 1 to 400 hp — in various enclosures. See your nearby Louis Allis District Office for information and application help. Or write for Bulletins 3150 and 3200 to The Louis Allis Co., 434 E. Stewart Street, Milwaukee 1, Wisconsin.

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MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

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60-216

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Selectively Coordinated Load Centers Deliver . . .

Best Service Continuity Under All Conditions

. . . Yet you pay no price premium if you buy from General Electric

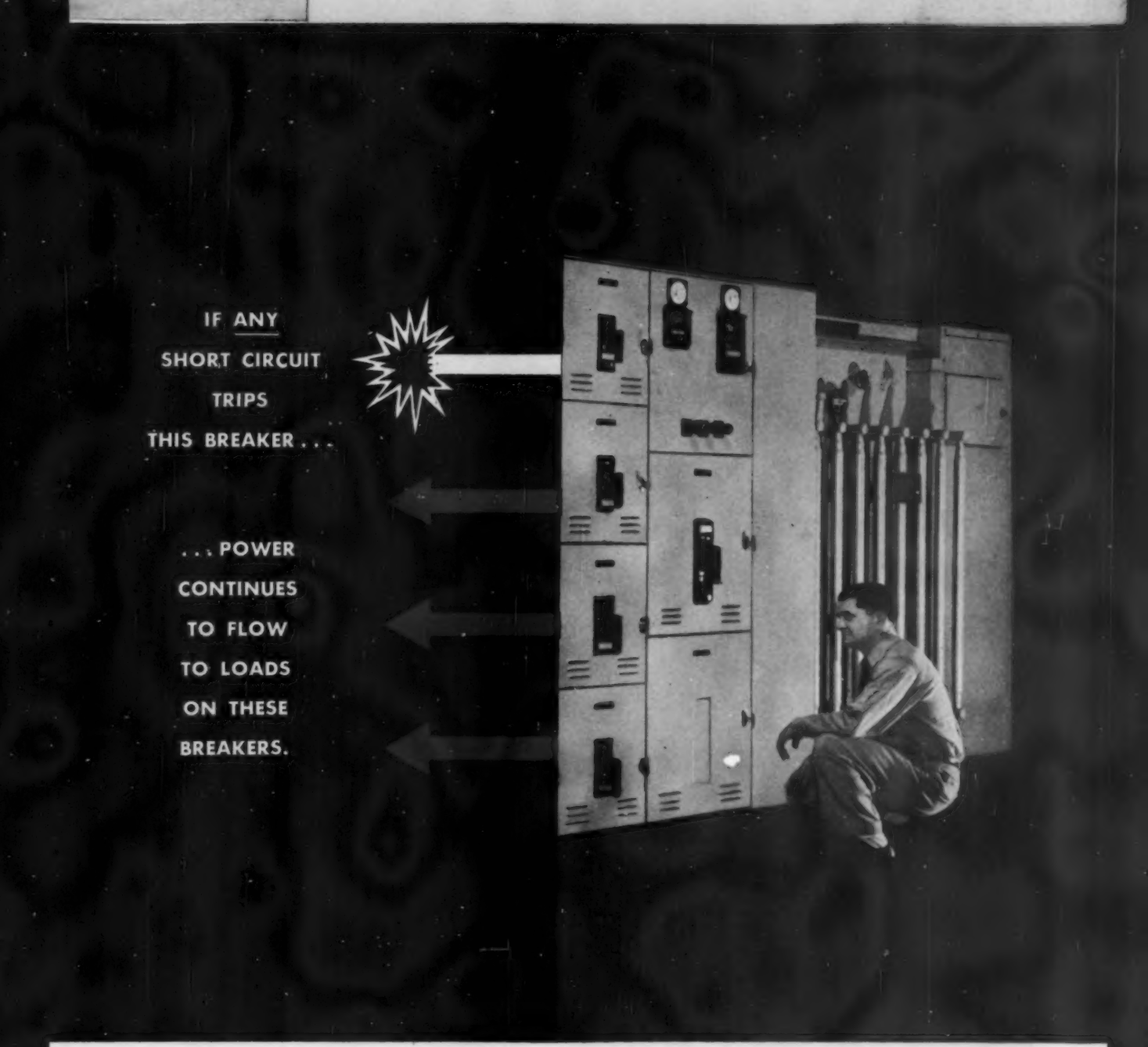
SELECTIVE COORDINATION GIVES BEST SERVICE CONTINUITY

SELECTIVELY COORDINATED Load-Center Unit Substations are your best assurance of power continuity. Power circuit breakers are factory-preset by General Electric so that—during short-circuit conditions—only the circuit breaker on the faulted feeder opens. Power continues to flow through unfaulted circuits to the rest of the loads. This "selectivity" between main and feeder breakers is accomplished by coordinating the tripping time of the main and feeder breakers.

During any magnitude of feeder short circuit, the main breaker "waits" until the feeder breaker opens.

YOURS AT LOWER COST

You now can have this superior coordination at no extra cost. Advanced engineering techniques by General Electric have eliminated the price premium normally charged for this inherently higher cost, more highly-engineered unit substation. In addition, you can save by using manually operated, stored-energy breakers in place of electrical units which were formerly required.



This means that General Electric SELECTIVELY CO-ORDINATED load centers are now available at the same price as the fully rated load centers.

ONLY CURVES PROVE YOU HAVE SELECTIVE COORDINATION

Specify the SELECTIVELY COORDINATED Load-Center Unit Substation, with coordination curves for the specific breakers in your Load Center. These curves will show you how time-current characteristics combine to assure you of maximum power service continuity.

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Despite similar appearance and ratings, these fluorescent lamps are *not* the same. One is a better lamp—and a better buy—because it's the only fluorescent lamp with all 6 advances described below. That lamp is made by Westinghouse. It costs you no more than any other leading brand—but it will give you years of trouble-free, efficient lighting.

1. **MORE EFFICIENT PHOSPHORS**—A special Westinghouse process selects Ultralume™ phosphor particles of a size proven to give more efficient lighting.

2. **BRIGHTER END TO END**—Lead wires are plated with super-hard Chrome Vanadium to make sure Westinghouse tubes *stay* bright, end to end.

3. **BUILT-IN "SHOCK ABSORBERS"**—Specially designed Westinghouse anodes act as buffers to cushion the terrific shock of electron bombardment and improve lamp life.

4. **"RAINCOATS" FOR RELIABLE STARTING**—Silicone "raincoats"

important advances that make it a better buy!

disperse moisture which can collect on exterior surfaces and prevent lamps from starting.

5. MIXED GASES—Westinghouse uses a precise mixture of certain rare gases, under exact pressure, to improve the light output.

6. TRIPLE-COILED ELECTRODES—To protect electrodes from the sudden electron bombardment when the lamp is first turned on. Emission material is quickly heated, fully protected.

Regardless of the type or wattage of fluorescent lamps you buy, you will get better value, more light for your money, and longer, trouble-free service if you specify and insist on Westinghouse fluorescent lamps. Westinghouse makes a complete line, from tiny 4-watt lamps for instrument lighting to the giant 96-inch Super-Hi™ Lamps for store, street, and factory lighting. Contact your authorized Westinghouse lamp agent or nearest Westinghouse sales office.

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IN 1957 a 14-year-old, welded, 3-drum water tube boiler required replacement of the steam drum and 295 tubes because of cracks. The cause—*embrittlement.*

In 1957, a 20-year-old, riveted, fire tube boiler was condemned and replaced because of cracks in the shell. The cause —*embrittlement.*

In 1957 a 36-year-old, riveted, 2-drum water tube boiler exploded, killing one man and destroying the entire powerhouse. The cause—*embrittlement.*

These instances are among the most costly and disastrous cases of embrittlement occurring in 1957. Other cases of embrittlement were detected in that year before extensive damage could occur. The year 1957 was not an unusual one for embrittlement except to the plants involved. Most people, today, think of embrittlement as something that happened only in the "horse and buggy days" of steam generation. However, every year another group of boiler operators discover, sometimes in a very costly or disastrous manner, that embrittlement is still ever present.

Figure 1—Embrittlement cracks in the rolled end of a tube.

It is true, of course, that caustic metal embrittlement has declined steadily as a major source of worry for boiler operators for the following reasons:

1. Improved boiler design and fabrication techniques have reduced boiler leakage, one of the conditions leading to embrittlement.
2. The Embrittlement Detector shows an operator when boiler water is embrittling.
3. The proper use of nitrate or coordinated pH-phosphate control effectively inhibits embrittlement.
4. The widespread use of improved methods of water treatment has eliminated, in many cases, the embrittling characteristics of boiler waters.
5. Practically all of the plants which had experienced embrittlement in the past have been using proper protective treatment since embrittlement was first discovered.
6. Some companies (perhaps because of past experience) apply protective treatment to all of their installations, old or new, as a matter of company policy. The cost of the chemicals is cheap insurance against possible loss of life, loss of production and loss of the powerhouse.

Unfortunately, however, all of these factors tend to reduce our awareness of embrittlement as one of today's problems.

Embrittlement is definitely one of today's problems. Any plant not using protective treatment, or any plant which has changed operating conditions or water supplies since their last Embrittlement Detector test could become a statistic or be liable for a costly repair bill next inspection.

Old age of boilers is no prerequisite for embrittlement. Caustic metal cracking has been found in boilers only *30 days old.* In fact, protective measures should be taken even during the boil-out of a new boiler.

The history and theories regarding embrittlement have been thoroughly covered in the past. A brief review of the causes, methods of detection and preventive measures will serve as a reminder.

There are three factors necessary to produce embrittlement of boiler metal:

1. Leakage of boiler water must take place so as to permit escape of steam and concentration of the boiler water at the point of leakage.
2. The boiler metal must be subjected to high stress. This stress may be internal, resulting from cold working of the metal, or the stress may be external, due to expansion or contraction.
3. The concentrated boiler water must possess embrittling characteristics that chemically attack the boiler metal.

Even in boilers with welded drums, inter-crystalline cracking may manifest itself at rolled in tube ends as illustrated in Figure 1.

Figure 2—The disastrous effects of embrittlement.

Detection

If it can be definitely shown that any one of the three factors of leakage, stress or embrittling characteristic of the boiler water is missing, it can then be safely concluded that the danger of embrittlement is non-existent.

The power plant engineer has little control over the factors of leakage and stress. Thus, the factor that best can be shown to be present or absent is the embrittling characteristic of the boiler water.

A chemical analysis of the boiler water will not reveal whether an actual or potential embrittlement problem exists.

The Embrittlement Detector (Figure 3) is the apparatus used to determine if a boiler water is embrittling. A test bar is exposed for 30 days in the Detector, and then check tests are repeated for 60 days and 90 days. If the bar shows cracks during the test, or shows cracks when it

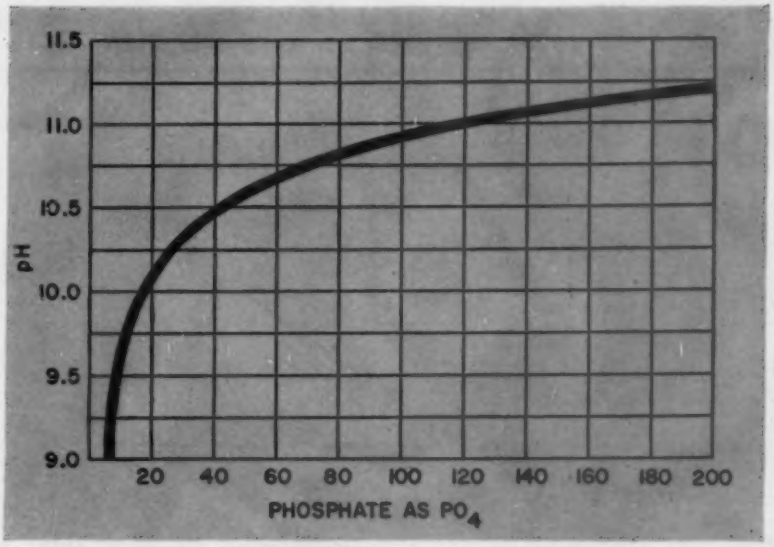

Figure 4—Approximate pH of trisodium phosphate solutions.

THE HIDDEN MENACE

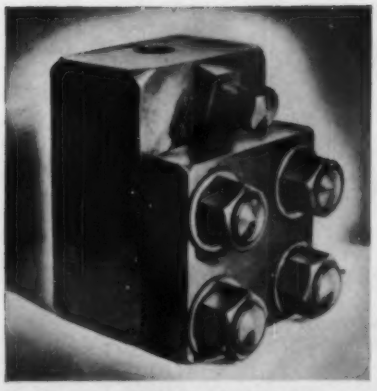

Figure 3—Embrittlement Detector.

is further stressed by the investigating laboratory, the water is embrittling and protective measures should be applied. If no cracking occurs, 90-day confirmatory check tests are run at yearly intervals or when changes are made in operating conditions or water characteristics.

Reliable results can be secured with the Detector providing care is exercised in adjusting the unit during the test. It is also essential that an accurate record of the adjustments be reported to the investigating laboratory so that interpretation of the accuracy of the test run can be determined. In some cases, improper adjustments of the unit have invalidated the test run, necessitating a rerun.

Protective Measures

A report of a cracked bar does not mean it is necessary to abandon the boiler house or seek a new water supply. A far simpler solution is available—the feed of *sodium nitrate*. Sodium nitrate has been inhibiting embrittlement for many years. Practically no cases of embrittlement have occurred nor have they been revealed by the Embrittlement Detector test when sodium nitrate was *properly* applied.

While nitrate is naturally present in many water supplies, the inhibition of embrittlement requires a definite ratio of nitrate to the caustic alkalinity present in the boiler water.

The ratios recommended depend on the operating pressure and are as follows:

	$NaNO_3/NaOH$ ratio
up to 250 psi	0.20
up to 400 psi	0.25
up to 700 psi	0.40

While sodium nitrate has been used in boilers operating as high as 900 psi, the preferred method for preventing caustic metal embrittlement in the high pressure range is the *coordinated pH-phosphate method*. This method depends on avoiding "free" sodium hydroxide (caustic) in the boiler water. Figure 4 illustrates the approximate pH of solutions of trisodium phosphate of various PO_4 content. The PO_4 content and pH of the boiler water are controlled or coordinated to intersect just below the curve. To insure the absence of "free" caustic, a direct analysis of the boiler water for hydroxyl ion should be used in conjunction with the curve.

Failure to take proper precautions against the ever-present but hidden menace of embrittlement will result in possible loss of life or extensive damage to property.

If you would like additional information regarding an embrittlement study made at your plant, we would be happy to have you write us. Why not do it *today?*

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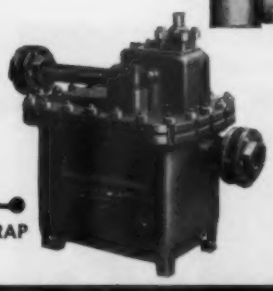

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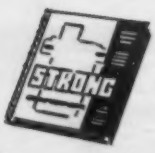

Selector Chart in Strong Catalog No. 69A gives trap recommendations for 45 types of equipment. Write for your copy or call your distributor.

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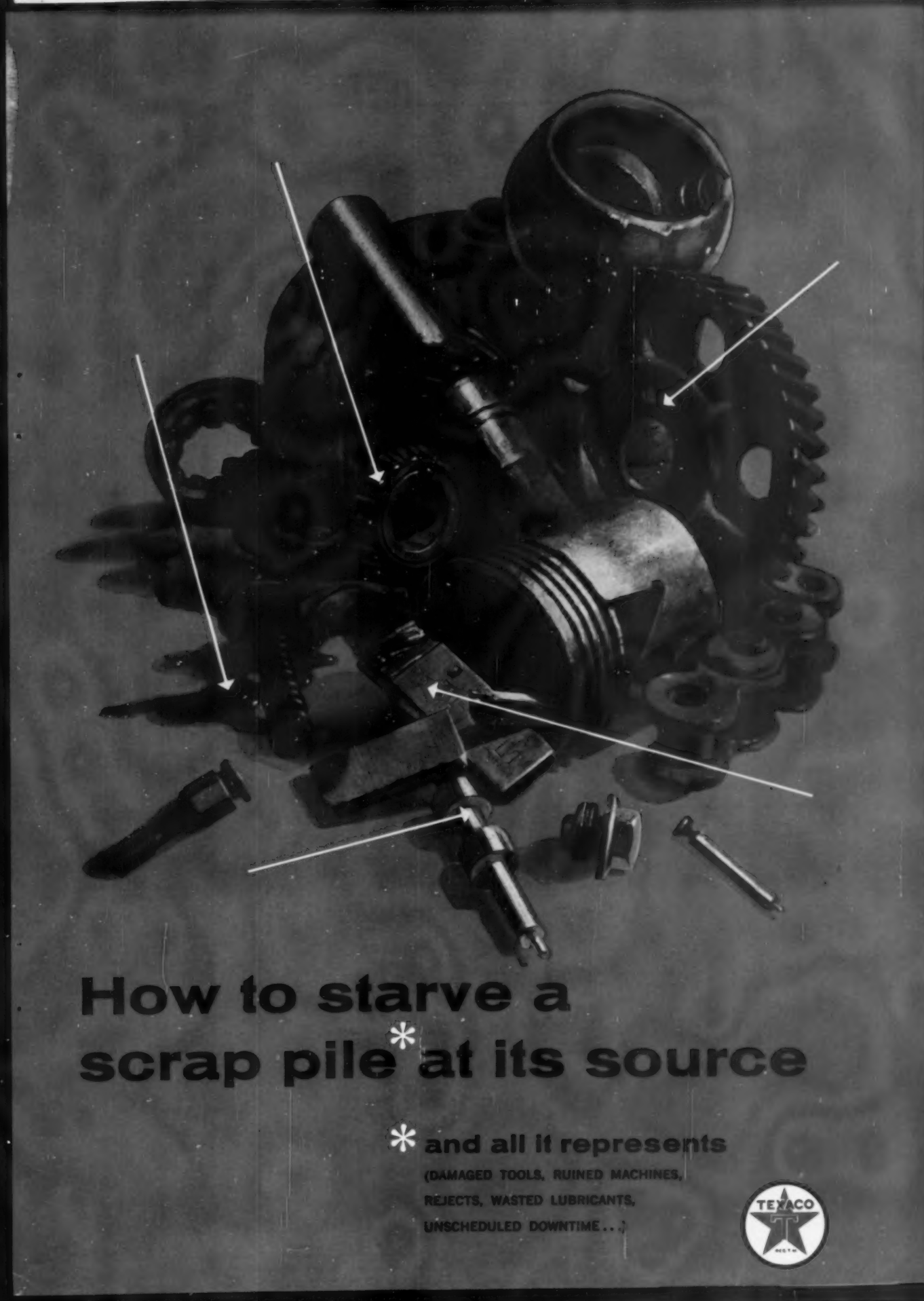
How to starve a
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* and all it represents
(DAMAGED TOOLS, RUINED MACHINES,
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UNSCHEDULED DOWNTIME...)
TEXACO

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Texaco's "Stop Loss" program has been developed for progressive managers in production, maintenance, purchasing, engineering and accounting who wish to apply new methods to control costs and add to profits.

The program has two purposes: (1) to demonstrate how organization of lubrication practices can be used to control costs resulting from product rejects, downtime, machine repair, excessive inventory, and (2) to provide specific instruction material to help plant groups find out where and how they can use Organized Lubrication to control costs in their own operations.

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TURN PAGE FOR WHY

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2. A film "package" for plant departments. This consists of movies on cutting oils, greases, hydraulic oils, etc., that may be selected for showing after seeing the "Stop Loss" film.

3. Coordinated booklets on the film subjects and others to be used as guides in specific areas.

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We can promise you that a modern Texaco Organized Lubrication Program will produce a package of economies in your plant. Texaco Inc., 135 E. 42nd St., N. Y. 17, N. Y.

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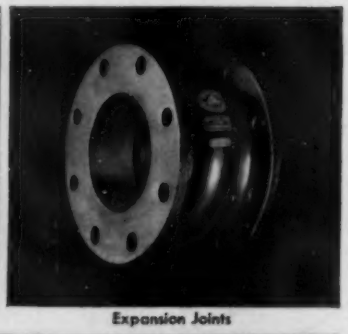
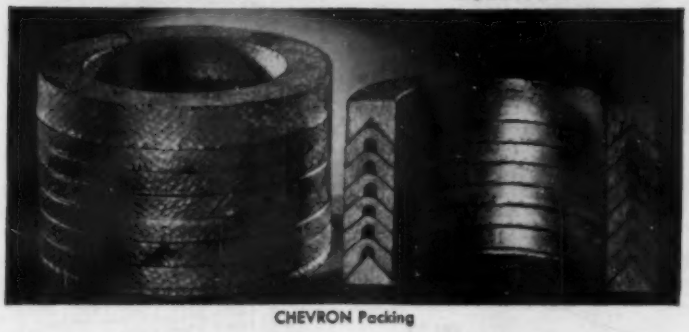


Expansion Joints



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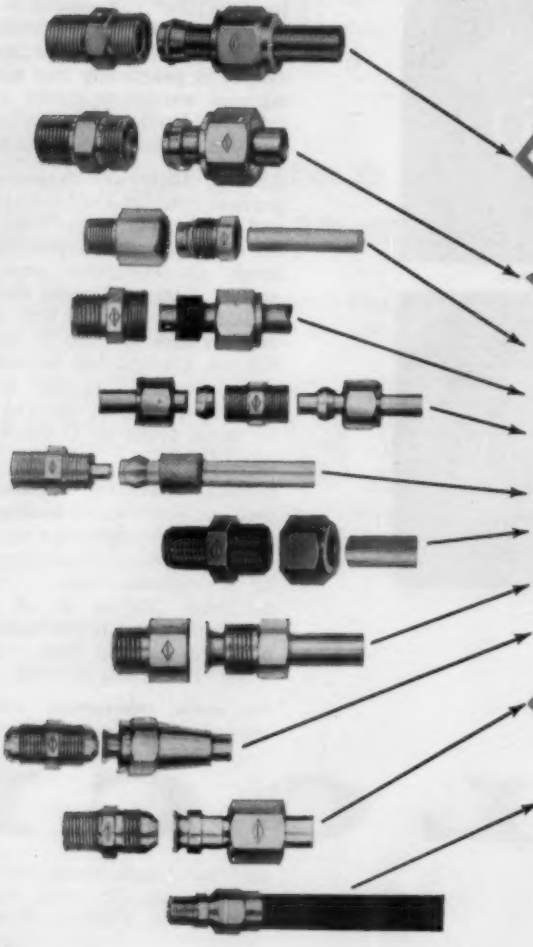

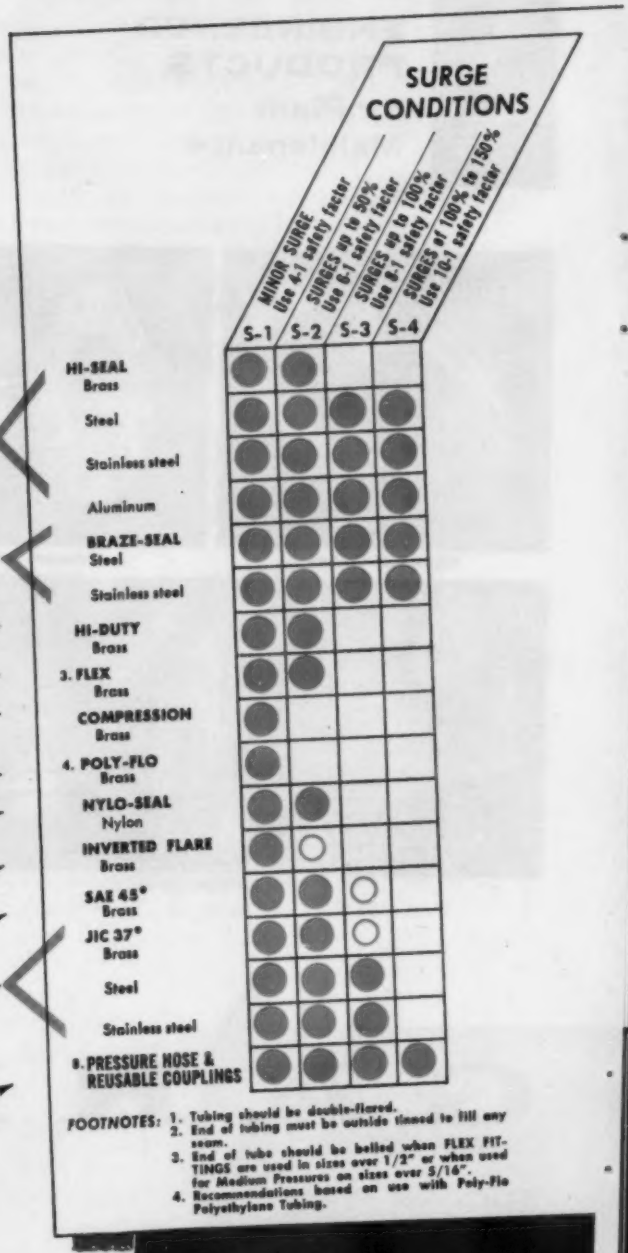

FOOTNOTES:
1. Tubing should be double-flared.
2. End of tubing must be outside tinned to fill any seam.
3. End of tube should be belled when FLEX FITTINGS are used in sizes over 1/2" or when used for Medium Pressures on sizes over 5/16".
4. Recommendations based on use with Poly-Flo Polyethylene Tubing.

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● Indicates ESPECIALLY RECOMMENDED for this purpose.

○ Indicates CAN BE USED for this purpose.

Numerals in Solid Circle or Ring—Use is subject to conditions as shown in footnotes.

Whenever possible select a fitting with a solid circle under each of the conditions applying to the job. If no one fitting has a solid circle ● in each classification, then select a fitting with solid circle ● or a ring ○ in each classification.

*Allowable working pressure will vary with the diameter of the tubing and the tubing material. For specific information write to factory.

**It is assumed tubing selected will be of material, temper and wall thickness adapted for pressure and application involved.

1. Recommended for working pressures to 125 psi—1/4" and 5/16" O.D.; 100 psi—3/8" O.D. Temperatures from –90° F. to + 175° F.
2. Recommended for working pressures to 250 psi. at temperatures up to 120° F.
7. When used with flexible plastic tubing.
8. See catalog for type of hose and couplings which meet your specific conditions.

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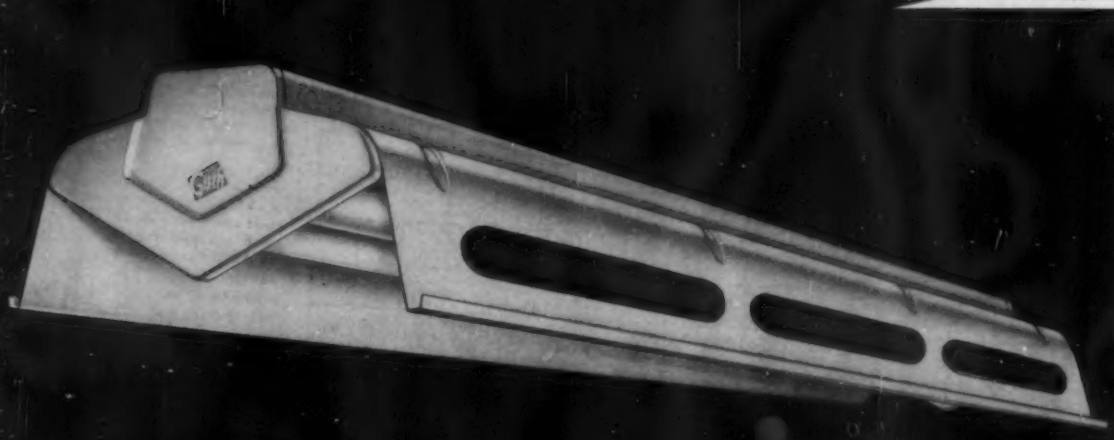

at exits, fire-protection systems, keep-out areas, etc.

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BULLETINS just released and of immediate plant interest

On pages 245-246 are the postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

LIGHTING, COMMUNICATION

Lighting Specifications—Included in the 52-pp 1960 edition of the RLM Standard Specifications, are three new specifications for 1500 ma units: D-4 fluorescent semi-direct medium high mounting SD-3AL semi-direct aluminum and SD-3PE semi-direct porcelain enamel units. The book contains many upward revisions of existing specifications, and new specifications for aluminum reflectors and added provisions for inspection. The RLM Standards Institute, Inc.

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Modern Lighting Needs—"Footcandles in Modern Lighting," is a 20-pp revised booklet giving lighting level recommendations for seeing tasks involved in hundreds of industrial and other activities. Figures are based on findings of Illuminating Engineering Research Institute and Illuminating Engineering Society. Also discussed are other aspects of lighting to be considered in making practical decisions about lighting levels. General Electric Co.

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Vapor-Tight Fixtures—Presented in this 52-pp catalog supplement is a complete line of vapor-tight aluminum lighting fixtures. They include pendant, ceiling and bracket types for a variety of installations. Reflector styles—shallow bowl, standard dome or angle—are also described, and information on accessories, adaptor plates and hangers provided. Killark Electric Mfg. Co.

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Floodlighting—Bulletin GEA-7201, 10-pp, stresses value of good floodlighting, and gives application data and product information on filament, mercury vapor and fluorescent units. Photos show typical applications in recreation area, architectural and ornamental lighting, loading platforms and industrial areas. Also tells how to get more light per dollar. General Electric Co.

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Electrical Signaling Equipment—Air and electric signal systems and specifications of horns, bells, buzzers, chimes and sirens are featured in 88-pp Catalog 160. Included are sections on gravity drop and lamp type annunciators and accessory equipment, and charts and diagrams for selection of proper type signal for various background noise levels and work areas. Sperti Faraday, Inc.

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FANS

Propeller Fans—Included in 20-pp Bulletin A-109 E are new low-speed high volume fans designed to increase efficiency and economy where large volumes of air must be moved because a single unit does the work of several smaller ones. Covers sizes from 65 to 94 in., in belt-, direct- or pulley drive. Other fans cataloged are ring and panel mounted types from 12 to 60 in., low noise and high pressure models, a reversible fan, and pedestal and spot cooling types. Dimensions, air delivery data and construction details given. Hartzell Propeller Fan Co.

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Tubeaxial Fans—Bulletin 625, 8-pp, describes construction features of Type BT and BTV belt-driven tubeaxial fans, 30-60 in., 3-50 hp with air deliveries to 85,000 cfm, and gives details for the various polluted and high temperature atmospheres they are designed to handle. Propellair Div., Robbins & Myers, Inc.

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Centrifugal Fans—Catalog 1120-1 contains 76-pp of detailed information on all-purpose centrifugal fans with flat, backwardly inclined blading, suited for supply and exhaust, general building ventilation, industrial processes. Key components and features are illustrated, and tabular performance data, and dimensions included. Sturtevant Div., Westinghouse Electric Corp.

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VALVES, TRAPS, PIPING

Solder Joint Valves—This circular lists in detail the size and dimensions of bronze gate, globe and check solder joint valves including the new No. 2 SJ gate valve. Each type is illustrated with a cutaway picture showing path of fluids through valve body. Illustrated set of instructions shows how to make a sound solder joint. Walworth Co.

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Check Valves—Bulletin WS-1A describes double cushioned check valves designed to prevent hammer and shock due to back surge. Gives dimensions for these valves intended for use on boiler feed lines, steam pumps, compressors, and reciprocating pumps. Golden-Anderson Valve Specialty Co.

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Relief Valves—Bulletin V-100/60, 24-pp, describes company's line of bellows valves for vapor service. It gives details and specifications on sizes, capacities, materials and other pertinent data. Seven features are listed. J. E. Lonergan Co.

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Safety-Relief Valves—Liquid relief and special service safety-relief valves, including a new, low cost compact series, are presented in 28-pp Catalog FE-138. Valves shown include types for hydraulic pressure systems, liquified gases, chemical corrosive service and general industrial service. Sizing information, capacity tables, weights and dimensions given. Farris Engineering Corp.

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Steam Traps—Forged steel steam traps for steam tracing and instrumentation service are described in Catalog 200. Diagrams showing operation are included, as well as physical data and capacities. Velan Steam Specialties, Inc.

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Power, Process Piping—Piping systems for industrial plants and others are highlighted in 24-pp Bulletin 60B. Includes case-history studies of over 30 plants. Also includes section on welding fittings and flanges. Midwest Piping Co., Inc.

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Welded Steel Pipe—Bulletin 509, 18-pp, pictures uses of Spang CW steel pipe ranging from heating, plumbing, and sprinkler systems to snow melting, and scaffolding. Illustrates Spang continuous weld process and tests. Specification tables for three weights of ⅛-in. to 12-in. pipe and couplings in black and galvanized given. The National Supply Co.

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Seamless Welding Fittings—Twelve-pp Bulletin 60-C describes design features and advantages of company's seamless-type welding fittings. Includes photos of fittings and describes manufacturing operations, dimensional and metallurgical control processes and testing procedures. Midwest Piping Co., Inc.

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PUMPS

Simplified Pump Selection—Technical data is simplified in this company's rotary pump selection manual. Groups liquids according to viscosity and each classification has its own selection table. Fast selection is possible by matching liquid to pump. Selection tables cover most all liquids. The Deming Co.

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Rotary Air Pumps—Catalog 460, 32-pp, describes rotary positive air pressure and high vacuum pumps, gas boosters and air motors. Gives construction details, dimensions, capacities, performance curves for all pumps, plus comprehensive engineering data. Included are two- and four-vane types, single and double cylinder, fan-cooled, water-cooled, air-cooled, oilless, motor-driven, belt-driven, direct-coupled, automatically controlled and integral pump and motor models. Leiman Bros., Inc.

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Pumps, Proportioners—Eight-pp Bulletin 600 describes Vari-Flow variable capacity rotary pumps, designed

BULLETINS

(Begins on page 25)

to let you "dial" desired flow rate, from zero to full capacity without changing pump speed. Explains principle of operation and includes cutaways of four basic models, in ball-bearing or packing-gland types, sizes to 450 gpm. Blackmer Pump Co.

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Sizing Cooling Tower Pumps—Six steps to be taken in sizing pump and piping of any cooling tower installation are explained in 6-pp Bulletin CT-360. Provides selection charts, pipe sizing tables and drawings of installations. Bell & Gossett Co.

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ELECTRICAL

Motor Application Guide—Sixteen-pp Bulletin 270B outlines characteristics of Century Electric Co. motors of 1/20 to 400 hp and includes design information on them. Discusses factors in motor selection and provides illustrated charts covering a wide range of motor-using equipment. Also shows gearmotors, selective speed drives. Century Electric Co.

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Induction Motor—Eight-pp Bulletin PB 6000-9 describes construction details and advantages of dripproof induction motors with form-wound stator coils. Illustrates stator frame and core, rotor, ventilation. Crocker-Wheeler Plant, Elliott Co.

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Unit Substations—Detailed information on features, operations and application of selectively-coordinated load center unit substations to provide continuous power for a-c distribution systems is presented in 32-pp Bulletin GEA-3592L. Compares types of load center arrangements and explains how selective coordination of load centers can be provided on any of four basic industrial and commercial building power distribution circuits. Includes photos, line system and schematic diagrams, time-current curves. General Electric Co.

▲ For a copy, circle 124 on Post Card

Articulated Substations—Comprehensive Workbook PSG-6001, 24-pp, aids in planning articulated unit substations for secondary distribution, and features a suggested specification form detailing data for a properly coordinated substation system. Ratings, weights and dimensions are included. Types of load centers and substations are described for indoor and outdoor use. Pennsylvania Transformer Div., McGraw-Edison Co.

▲ For a copy, circle 125 on Post Card

Load Centers—Twin circuit breaker load centers designed to double circuit capacity of load centers are featured in 16-pp Bulletin GEA-7071. Cutaway view showing component features is included, as well as tips on installation, selection data. General Electric Co.

▲ For a copy, circle 126 on Post Card

Rotary Handle Breakers—Eight-pp Bulletin 1425 introduces rotary handle circuit breakers and discusses use in switchboards, control centers, panelboards and enclosed circuit breakers. Describes features of the handle mechanism—built-in construction, effortless operation, locking provision etc. Also covers application of the 15- through 800-amp breakers. Federal Pacific Electric Co.

▲ For a copy, circle 127 on Post Card

On Bus Duct—Application data for plug-in, low-impedance, high-frequency and electric utility bus duct is contained in 12-pp Booklet 30-660. General information, descriptions and drawings illustrate applications. Westinghouse Electric Corp.

▲ For a copy, circle 128 on Post Card

Cable Splicing Fundamentals—Illustrated with step-by-step photos, this 30-pp booklet explains procedure for splicing and terminating rubber-Neoprene cables, shielded and unshielded. Also includes tape selector and quantity estimating charts, product information and a purchase planning aid sheet. The Okonite Co.

▲ For a copy, circle 129 on Post Card

Silicon Rectifiers—Booklet B-7900 tells why silicon rectifier packages offer d-c power saving to electrochemical and allied industries. This 20-pp publication presents a detailed description of a silicon power package and states the advantages of silicon over other rectifying methods. Westinghouse Electric Corp.

▲ For a copy, circle 130 on Post Card

INSTRUMENTS, CONTROLS

Pneumatic Process Instruments—Pneumatic instruments for process industries are described in 12-pp Catalog 5151. Pressure and temperature pilots and pneumatic transmitters are featured. Pilot specifications are listed and control actions described. Optional indicating controller features are covered, including pneumatic set-point, control by-pass and valve positioner. U. S. Gauge Div., American Machine and Metals, Inc.

▲ For a copy, circle 131 on Post Card

Telemetering Systems—Metameter telemeters for remote measurement, recording and automatic control are described in 52-pp Bulletin M1715. Covers principles of operation, types; application to various measurands, including pressure, water level, temperature, flow, motion and position; and electrical quantities. Several applications in various industries and utilities are covered. The Bristol Co.

▲ For a copy, circle 132 on Post Card

Automation and You—Sixteen-pp Bulletin GED-3908, discusses technology, equipment and economics of automation. Assesses current state of automation art, summarizes need for and economic benefits of automation, and provides information on six key functions: process control, computing, instrumentation, numerical control of machines, sensing, and communications. General Electric Co.

▲ For a copy, circle 133 on Post Card

Digital Information System—Operation of Metrotype digital information system using all solid state components is described in 8-pp Bulletin E72-2. Specifications are listed along with a variety of readout devices. Also included is block diagram of basic elements of the system. Bailey Meter Co.

▲ For a copy circle 134 on Post Card

Process Control Systems—This 12-pp booklet outlines company's approach to industrial process control system, covering benefits of a total systems approach, single-source responsibility, and guarantee of 99 per cent operational availability. It discusses the flexibility of a typical control system, listing the control-associated functions performed automatically, and illustrates the experience in such processing field as power, steel and petrochemical. Daystrom, Inc.

▲ For a copy, circle 135 on Post Card

CONSTRUCTION

Planning a New Building?—This little booklet of "money saving ideas" discusses items to be considered before plans are drawn. Among these are importance of color in building's design, lower construction costs, fire safety, ventilation, financing. Stran Steel Corp.

▲ For a copy, circle 137 on Post Card

Steel Joist Data—Open-web steel joists meeting Steel Joist Institute specifications are covered in Technical Bulletin 70-7. Provides dimensions and properties. Joseph T. Ryerson & Son, Inc.

▲ For a copy, circle 138 on Post Card

Handbook on Waterstops—In the 24-pp Kwik-Seal Waterstop Technical Manual is a wealth of practical information on their use. Covers sizes and shapes of the waterstop, comparative data for rubber and plastic types, handling and storage of the material, design data for both "little" and "considerable" movement joints, application data for installation, and splicing methods. Gates Rubber Co.

▲ For a copy, circle 139 on Post Card

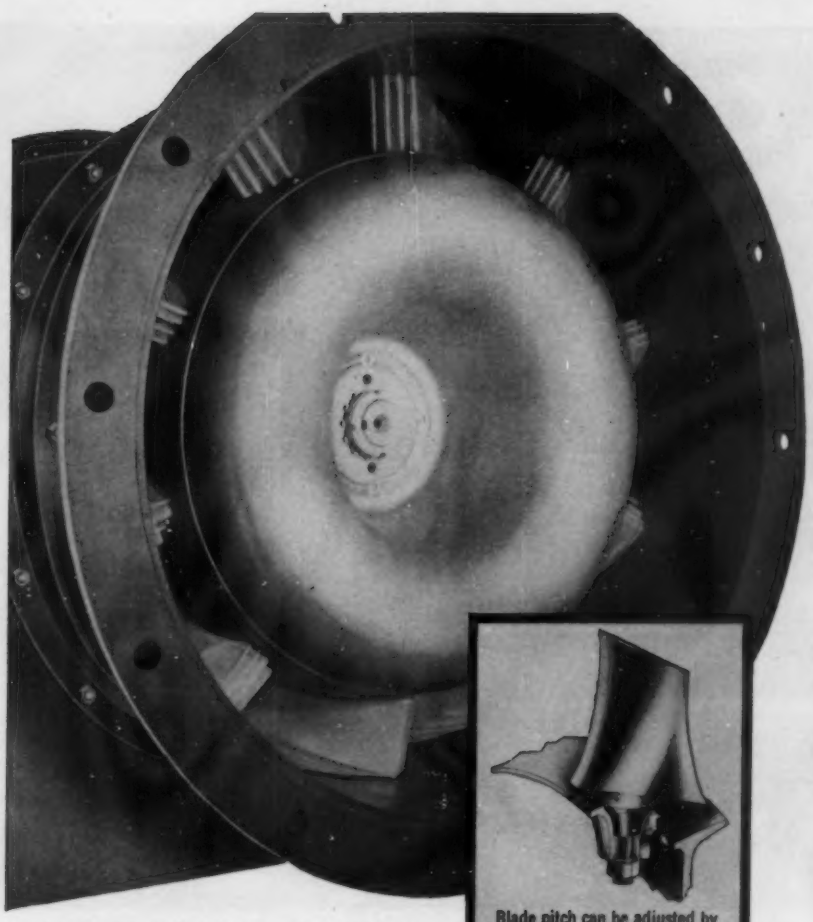
Acoustical Tile—Characteristics of Styltone, a non-combustible, random-fissured acoustical tile, are presented in this brochure. Illustrates attractive travertine effect of the mineral tile in typical installations. Styltone's sound absorption coefficients are tabulated, and sizes, styles are covered. Baldwin-Ehret-Hill, Inc.

▲ For a copy, circle 140 on Post Card

Metal Rolling Doors—Described in this 36-pp catalog are steel or aluminum rolling doors for industrial and other applications. Generously illustrated with installations photos, book contains pictorial index to door types and devotes several pages to general features—interlocking slat curtain design, methods of operation, types of mounting. Covers rolling service doors, rolling grilles, fire doors, bifold doors (steel or wood), counter shutters and sectional overhead doors, also electric motor operators. The Kinnear Mfg. Co.

▲ For a copy, circle 141 on Post Card

(More Bulletins on page 235)



Multiple exposure shows fan blades through the full range of pitch changes.

Blade pitch can be adjusted by loosening one nut, resetting the blade to desired position on calibrated scale, and retightening the nut.

Joy Design Means:

MINIMUM POWER CONSUMPTION WITH VARIABLE FAN OUTPUT

Blade pitch on Joy Axivane® Fans can be adjusted easily. This means that the volumetric output of Joy fans can be varied by as much as ± 20% without any sacrifice of fan efficiency, and therefore with minimum power consumption. And with no efficiency losses such as are encountered with dampers and variable inlet vanes. (Where efficiency losses may be tolerated, the volumetric output may be changed by as much as 400%.)

Even at full load, Joy Axivane Fans are more efficient than propeller, tube-axial and centrifugal fans. The direct drive achieved by mounting the motors inside the fan housings eliminates drive losses, and the vane-axial design gives maximum aerodynamic efficiency. Mounting the motors in the housings also makes the Joy Axivane Fans more compact, and less costly to install.

Fans available range from types which weigh as little as a pound and have a diameter of a few inches, up to some which weigh tons and have diameters up to twelve feet. If you need spot cooling, area ventilation, or any movement of air, Joy can supply the most efficient answer.

For complete information, write for Bulletin 1278-15.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY

JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

For more facts circle 516 on Reply Card

HINGED ARC CHUTE of type DH magnetic air circuit breakers permits tilting of chute for full accessibility of arc chute interior and contacts for inspection. ISOLATED CENTER COIL design employed in the DH breaker arc chutes provides more efficient arc interruption.

NEW...

DH BREAKER ADVANCES EXPAND CAPABILITIES OF METAL-CLAD SWITCHGEAR

Greater margins of safety and increased convenience of operation and maintenance . . . available with recent design advances in Westinghouse metal-clad switchgear

The HINGED ARC CHUTE of DH breakers affords ease of handling and facilitates inspection of arc chute interior and contacts. On smaller DH breakers, the arc chutes are tilted directly by hand. On larger breakers, the arc chutes are tilted by a compact, lightweight auxiliary device operated through the levering-in mechanism.

The ISOLATED, CENTER COIL DESIGN employed in the arc chutes of DH magnetic air circuit breakers permits more efficient arc interruption for any rating. This center coil design provides better magnetic field distribution . . . better insulation . . . increased field strength—all resulting in superior DH breaker performance.

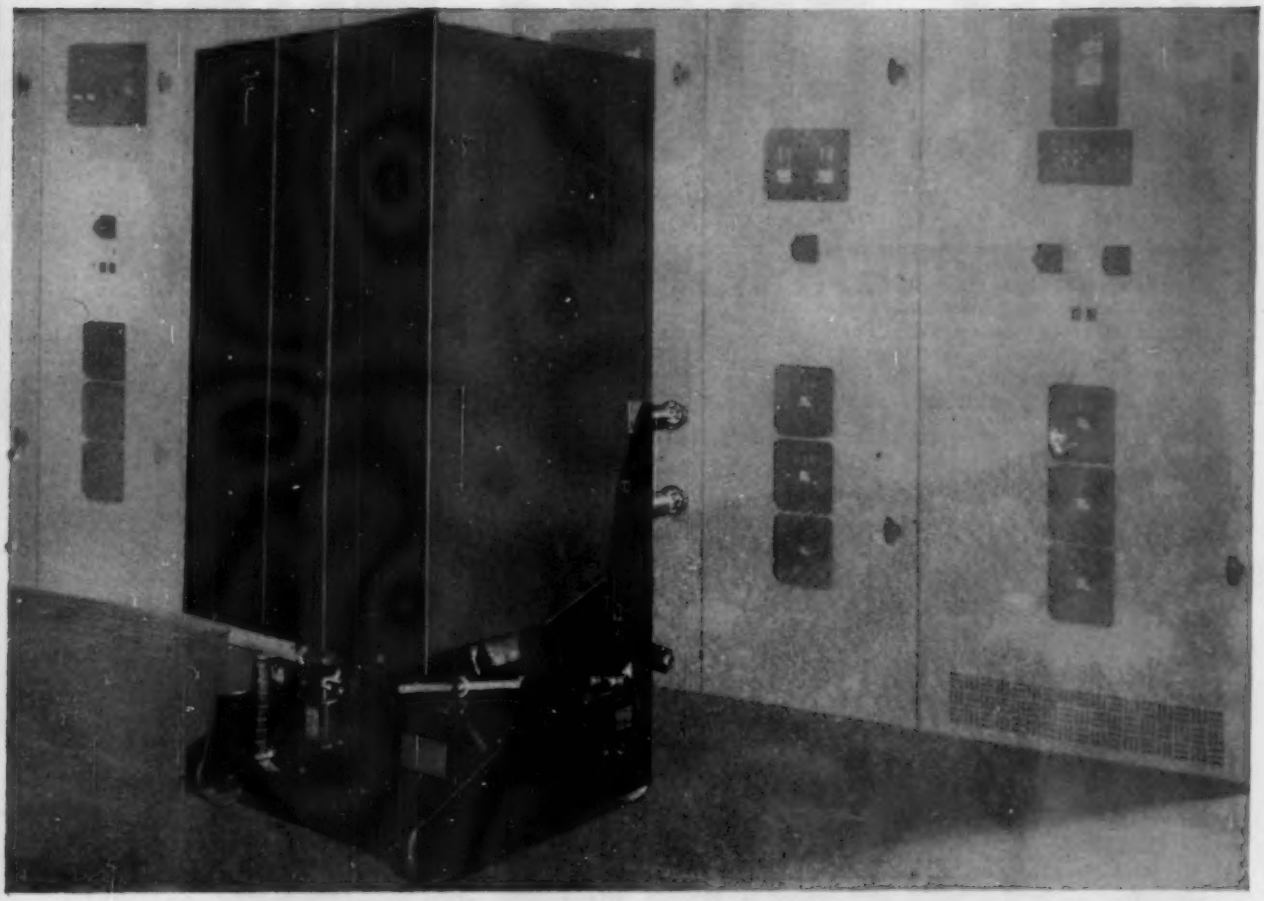
LIMITRAK* INSULATION SYSTEM, a recent Westinghouse development, provides superior, balanced insulation in metal-clad switchgear. *Limitrak* glass polyester is used on DH breaker arc chutes, end channels and supports. *Limitrak* coating is employed on DH breaker bushings. *Limitrak* design is incorporated on porcelain bus supports of the metal-clad switchgear housing. Westinghouse *Limitrak* has been proved by test to be 300 times more track resistant than ordinary grades of glass polyester, and is also highly flame retardant. Get complete information on these Westinghouse metal-clad switchgear developments from your Westinghouse representative. *Trade-Mark

Quality Westinghouse metal-clad switchgear offers more value in continuity of service and economy of operation

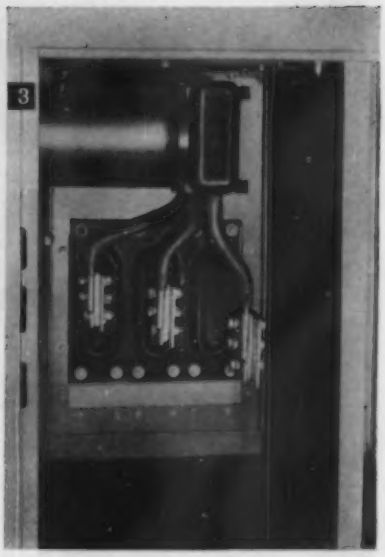
YOU CAN BE SURE...IF IT'S

Westinghouse

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29



Completely assembled DH breaker, ready for installation in the metal-clad switchgear stationary structure.



Limitrak Insulation System is employed . . . **1** On DH breaker arc chute sides, end channels and supports. **2** On DH breaker bushings. **3** On bus supports of metal-clad switchgear housing. J-60975

For more facts circle 517 on Reply Card

NEW...FROM TUBE

FROM YOUR TUBE TURNS' DISTRIBUTOR

The complete line of PIPE-MATE Fittings, Flanges and Accessories are available from your nearby Tube Turns' Distributor. For pipe sizes ½" to 4"... Schedules 5S and 10S... in Types 304L, 316 and 316L.

TURNS...

PIPE-MATE light-wall stainless steel fittings and flanges

Tube Turns introduces another important key to lower piping costs... a new line of light-wall stainless steel fittings and flanges for process piping. Here's how this PIPE-MATE* line reduces costs...

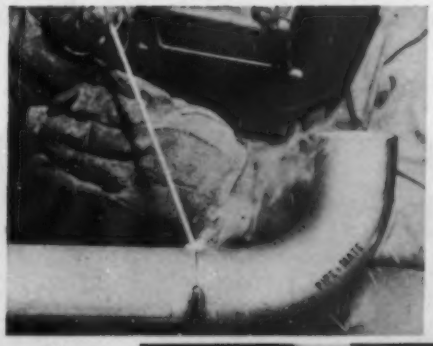
Cuts material costs. Compared to standard weight Schedule 40S pipe, *light-wall* piping in Schedule 5S or 10S cuts material costs as much as 30% to 50%. It weighs ½ to ⅓ as much, is easier to handle, easier to install and provides greater flow area.

Simplifies installation. Extra long tangents of PIPE-MATE fittings provide full straight-line clearance for fitting-to-fitting connections and permit fabrication of completely flanged elbows, returns, tees, etc. Aligning connector speeds making of socket type joints. Fittings may be butt-welded, fillet-welded, brazed or soldered, or joined by rolled-in flange connections.

Here is another plus value you get when you specify products of Tube Turns and buy them from your Tube Turns' Distributor.

FREE BULLETIN on PIPE-MATE Fittings and Flanges describes complete line, shows installation procedures, and gives properties and dimensional tolerances. Mail coupon for copy.

*"PIPE-MATE" and "tt" are trademarks of Tube Turns.



FOR BUTT-WELDING

FOR FILLET-WELDING, BRAZING OR SOLDERING

FOR ROLLED-IN FLANGED JOINTS

Another tt *plus value from...*

TUBE TURNS

DIVISION OF CHEMETRON CORPORATION

Louisville 1, Kentucky

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DISTRICT OFFICES: Atlanta • Buffalo • Chicago • Columbus • Dallas • Denver Detroit • Houston • Kansas City • Los Angeles • Midland • New York Philadelphia • Pittsburgh • Richmond • San Francisco • Seattle • Tulsa

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In Mexico: TUBE TURNS DE MEXICO, Mexico City

TUBE TURNS
Department PE-7, 224 East Broadway
Louisville 1, Kentucky

Please send bulletin TT944AR.

Company Name _____

Company Address _____

City _____ Zone ____ State ____

Your Name _____

Position _____

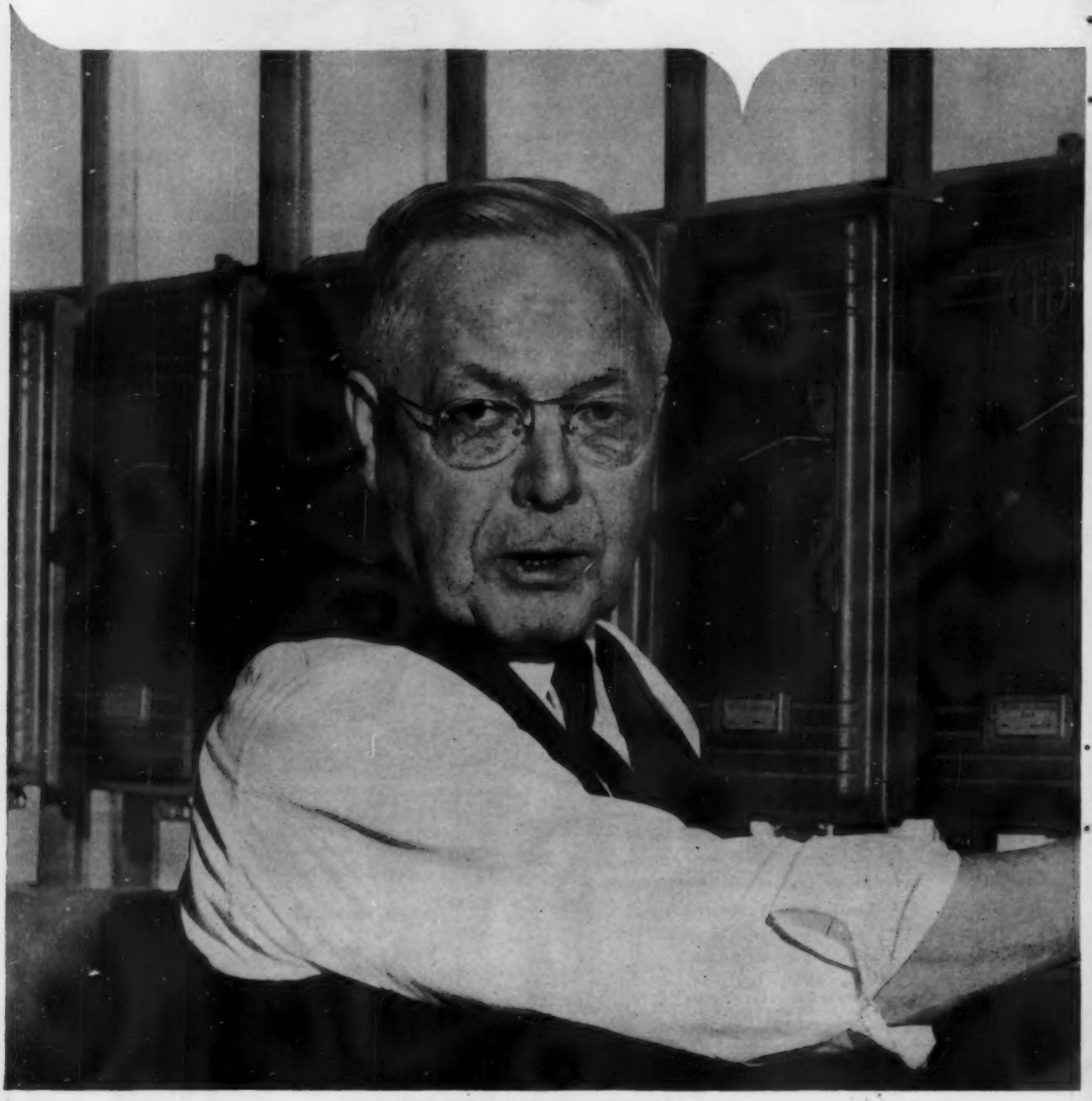
For more facts circle 518 on Reply Card

"Those young fellows

"They think they're the only ones who know about circuit breakers. Why, by golly, you don't have to be young to be smart. And you don't have to be old to be old-fashioned, either.

"Fact is I switched over to circuit breakers before a lot of the young fellows did. Now when I have a new circuit to put in, I *always* use a circuit breaker. That is, for lights, bench outlets, machines, motors . . . all the things we need electricity for in this plant.

"I should think everybody today would know how circuit breakers cut down the time loss when electricity goes out . . . how easy they make it to restore power . . . and how safe they are.



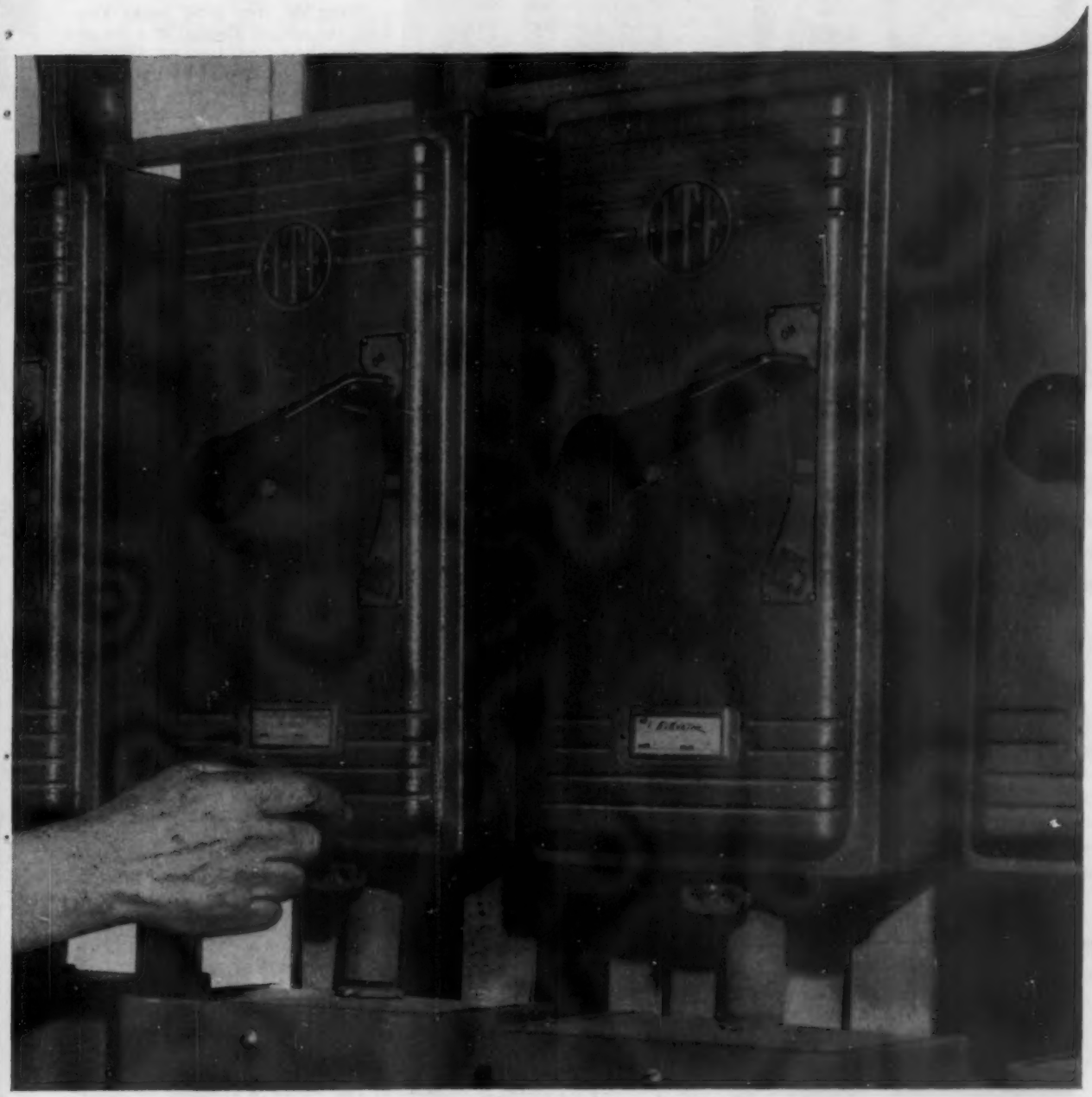
can't get ahead of me"

"One guy I know claims circuit breakers are too expensive. Why, nothing's cheaper than a circuit breaker. Just have one overload and you'll discover that. Have very many and your circuit breaker pays for itself, and then some.

"What brand circuit breaker should a fellow insist on getting? Well, ask around. See if you can find anybody who doesn't agree that I-T-E is the best."

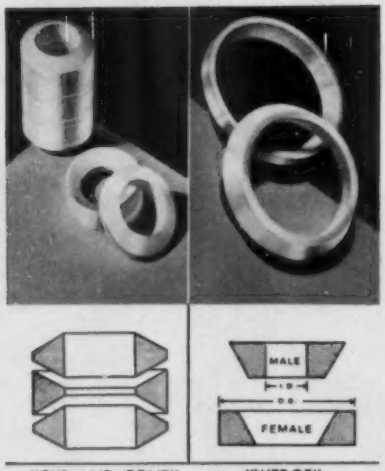
Send for the new, free bulletin on how circuit breakers can benefit industrial plants. Or see your distributor. I-T-E Circuit Breaker Company, Dept. SA, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY



For more facts circle 519 on Reply Card

NEW CHEMPRO LOW GLAND PRESSURE TFE TEFLON† PACKING SETS



"CUP AND CONE" "WEDGE"

USED FOR VALVES, HEAT EXCHANGERS AND OTHER STATIC AND SEMI-STATIC APPLICATIONS

Chempro Style 300 "Cup & Cone" and Style 305 "Wedge" packing ring sets are two new resilient, low gland pressure packings designed for tight, sure sealing with a minimum gland pressure. Nominal gland pressure causes the rings to slide against each other, exerting pressure both against the stem or rod and the bore.

These packings have all the advantages of Teflon, being completely unaffected by the strongest acids, solvents and alkalies.

COMBINATION SETS AVAILABLE FOR ROTATING SERVICE

Resilient Chempro "Cup & Cone" or "Wedge" rings can be combined with tough, pressure-resisting Chempro Style 101 packing rings to form a rugged combination set ideal for use on a wide range of rotating or reciprocating services.

Write for revised Chempro Bulletin CP-552, giving complete ordering information.

† duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

For more facts circle 520 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Satisfied Reader

PLANT ENGINEERING:

"From my previous experiences as a plant engineer, when I received your magazine and read it, almost invariably with benefits, I feel you may be able to help me with a present problem.

"I am interested now in laying out maintenance shops and store room facilities, and I wonder if you have any recent articles on the subject, particularly as pertains to a pulp or paper mill.

"If you have any such articles, would you please send me tear sheets if available, or references by which I can look up the article in a library." *R. H. Bernstein, Charles T. Main, Inc., Boston, Mass.*

▶Tear sheets on layout of maintenance facilities are still available.—*Editors.*

Lighting Survey

PLANT ENGINEERING:

"We read with a great deal of interest your article on 'Industrial Lighting Practices' on page 121 of the February, 1960 issue of PLANT ENGINEERING. This PLANT ENGINEERING Reader Survey is presented in such a direct way, we should very much like your permission to reproduce this article for our representatives, approximately 300, to carry in their sales portfolios." *John B. White, Sales Promotion Manager, Verd-A-Ray Corporation, Toledo, Ohio.*

▶ Permission granted.—*Editors.*

Could We Say More?

PLANT ENGINEERING:

"I have decided that, rather than be provoked at not getting PLANT ENGINEERING until two or three months after publication date, I'd solve the problem with a subscription. Simple, isn't it!

"I think your magazine is tops, and you prove your statement about 'helping Plant Engineers with their everyday problems' more correct with every issue. However, I have a question which certainly isn't original. Why not print such things as 'Construction Briefs,' 'Construction Cost Estimating,' and the series you had on specifications, on perforated sheets that could be easily removed and saved? I presume costs are a big part of it, but this kind of information is helpful to practically everyone. Be that as it may, it's still a darn good magazine.

"I am enclosing a check for $16.75 which breaks down something like this:

"$10.00 for a one-year subscription to start at once.

"$6.75 for reprints of the articles checked on the enclosed list.

"Keep up your good work. You have the unsaid 'Thanks' of a lot of us. For the record, I am an Assistant to the Works Engineer here at Tonawanda, and you have been helpful to us in solving several of our problems." *(Writer's name and address withheld on request.)*

▶ Inasmuch as this reader is an assistant to the Works Engineer, we have sent him a verification form so that he can receive subscription service without charge.

Perforating the pages on certain departments such as the Construction Briefs. would be quite simple, but we have observed that some magazines that do have special binding and perforating arrangements, just do not hold up under severe service. Instead, we are always pleased to send tear sheets of any article, so that individual copies of PLANT ENGINEERING need not be mutiliated.—*Editors.*

Charts for Compressed Air

PLANT ENGINEERING:

"Noting in the April issue the letter about data on sizing pipe for compressed air, reminds me that we also would very much appreciate receiving any available charts pertaining to the same subject.

"As our business is the manufacture of all-steel cooling towers and evaporative condensers, we would also appreciate receiving three tear sheet copies of the article on 'Cooling Water Troubles and Treatment,' in the April, 1960 issue of your magazine." *W. D. Geiser, Production Manager, Baltimore Aircoil Co., Inc., Baltimore, Md.*

▶Copies of these articles have been sent with our compliments.—*Editors.*

Spark Test for Metals

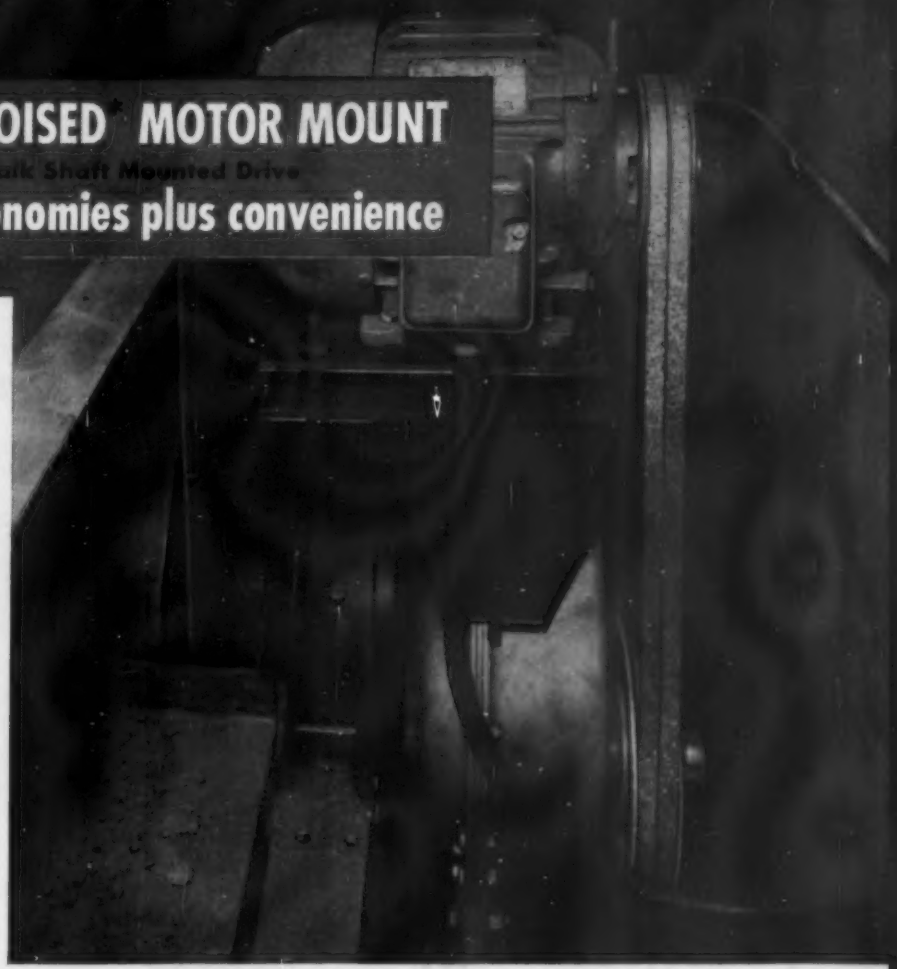
PLANT ENGINEERING:

"We have been referred to you as having available a copy of a reprint on the spark testing of various steels. If this reprint is available for distri-

NEW FALK EQUI-POISED* MOTOR MOUNT

for use with the Falk Shaft Mounted Drive

gives unequaled economies plus convenience

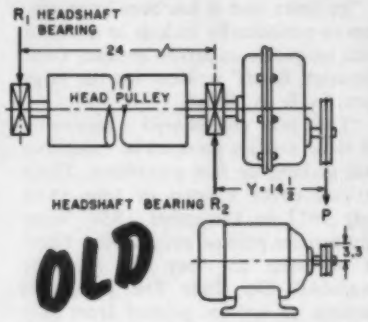


HOW A FALK EQUI-POISED MOTOR MOUNT REDUCES BEARING LOADS ON A DRIVEN MACHINE

GIVEN: Motor—15 hp, 1750 rpm, Frame 284U, Weight—320 lb.
Sheave diameters—6.6/9.4
Driven machine—belt conveyor with 24" center distance between headshaft bearings.

NOTE: Weights of 307J24 Shaft Mounted Drive, sheaves, and V-belts are eliminated from calculations because they remain constant; do not affect the comparison.

WITHOUT FALK MOTOR MOUNT



Torque at motor shaft = $\frac{63{,}025 \times 15 \text{ hp}}{1750 \text{ rpm}}$ = 540 lb-in.

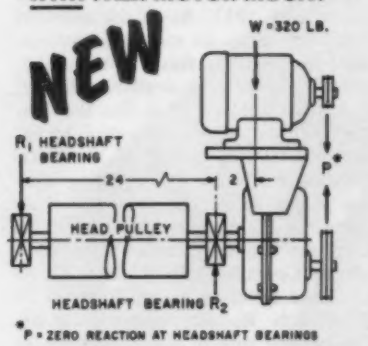
Belt pull (P) = $\frac{540 \text{ lb-in.} \times 1.5 \text{ Load Connection Factor}}{3.3"}$ = 246 lb

$R_2 = \frac{246 \text{ lb} \times (24" + 14.5")}{24"}$ = 395 lb

$R_1 = \frac{246 \text{ lb} \times 14.5"}{24"}$ = 149 lb

(Check: 395 lb—149 lb=246 lb)

WITH FALK MOTOR MOUNT



*P = ZERO REACTION AT HEADSHAFT BEARINGS

V-belt pull has zero reaction on headshaft bearings. Therefore—

$R_2 = \frac{320 \text{ lb} \times (24" + 2")}{24"}$ = 347 lb

$R_1 = \frac{320 \text{ lb} \times 2"}{24"}$ = 27 lb

(Check: 347 lb—27 lb=320 lb)

Falk's new EQUI-POISED* Motor Mount is a rigid, all-steel weldment, pre-drilled for bolting standard NEMA foot-mounted motor (1/2 to 30 hp) directly to the steel frame of Falk Shaft Mounted, Flange Mounted and Screw Conveyor Drives. With it, motor can be mounted in almost any position around perimeter of reducer.

(*Balancing of forces.)

Substantial Savings for You

It saves engineering time required to design special motor bases and foundations...saves cost of labor and materials required to build special motor foundations...and saves on equipment costs by using a quality stock component. Further, its quick installation and easy maintenance mean added cost savings. The Motor Mount is a space saver, too. Where restricted space is a factor, ability to mount motor in any of several positions is an important convenience...For information on range of sizes, dimensions, etc., contact your Falk Representative or Distributor—or write direct for Bulletin 7100.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN

MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS

FALK

a good name in industry

Representatives and Distributors in most principal cities

FALK is a registered trademark

For more facts circle 521 on Reply Card

GTC

UNITIZED
COMMUNICATION EQUIPMENT for POWER and INDUSTRY

Effective! Reliable! Economical!

1 Highly effective in extremes of ambient noise and temperature.

2 Plug-in units provide ease of installation, expansion and maintenance.

3 Transistors and rugged, industrial type components used throughout.

4 Central control cabinet, costly engineering and fabrication eliminated.

Wherever a highly dependable, voice communication system for use in high noise level areas is needed—you'll find GAI-TRONICS specified by name.

GTC is so extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

GAI-TRONICS
CORPORATION
Dept. C
READING, PENNA.

GAI
FOUNDED 1946

A SUBSIDIARY OF GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS

For more facts circle 522 on Reply Card

BACKTALK—FORETHOUGHTS

bution, will you please send a copy to the writer. If there is any charge, please advise so that we may mail you an order." *T. R. Coyle, Division Purchasing Agent, Sylvania Electric Products, Inc., Sylvania Chemical & Metallurgical Div., Towanda, Pa.*

▶ We have referred this reader to a report published by the Office of Technical Services, U. S. Dept. of Commerce, which describes a method for selecting metals safe for use in explosive atmospheres. The report, PB 151650, "Sparking Characteristics of Metals" by G. J. Dashefsky, New York Naval Shipyard, U. S. Navy, August 1958, may be ordered from OTS, U. S. Department of Commerce, Washington 25, D. C. It costs 50 cents.

A related report, released earlier and still available from the same address, is PB 131131, "Sparking Characteristics and Safety Hazards of Metallic Materials," by H. Bernstein, U. S. Naval Gun Factory, April 1957, price $1.00.—*Editors.*

Legal Aspects of Engineering

PLANT ENGINEERING:

"I am trying to establish the close relationship that I believe exists between plant engineering work and the legal aspects of property, agency, contracts, etc. I find that in my everyday work I require a knowledge of the law just as I require a knowledge of current engineering developments. Can you refer me to any articles which would help me establish this point. I would appreciate any information that you can give me." *C. J. Summers, Plant Engineer, Franklin Sugar Refinery, Philadelphia, Pa.*

▶ One of the best proofs that plant engineering does have its legal aspects, is the fact that for a number of years we have, at the request of our readers, devoted a department to court decisions on the type of cases that would interest plant engineers.—*Editors.*

Something Was Missing

PLANT ENGINEERING:

"For the benefit of the readers who may be puzzled by it, a portion of Mr. Nailen's article, 'Selecting Best System Voltage' March 1960, PLANT ENGINEERING, got a bit garbled in publication. On page 126, about the middle of the right hand column, there is a sentence that doesn't sound right:

" 'If a 208-volt system is to be used, and voltage is not to be limited to 208 plus or minus 10 per cent.'

"This should read:

" 'If a 208-volt system is to be used, and voltage is not to be limited to 208 plus or minus 5 per cent, then a 208-220/440 volt (motor) may not be satisfactory. The alternative, of course, is a motor designed and rated for 208-volt operation, plus or minus 10 per cent.' " *Vincent J. Rinaldi, Technical Publicity, Westinghouse Electric Corp., Pittsburgh, Pa.*

▶ Two lines of type were inadvertently dropped from the article. We hope this note will clear up any questions our readers may have had about this statement.—*Editors.*

Construction Brief Reprints

PLANT ENGINEERING:

"In years past it has been your custom to periodically include in issues of your magazine an article entitled 'Construction Briefs' written, for the large part, by B. A. Wasil.

"Last year you offered a reprinting of these articles grouped in categories and making up five pamphlets. These articles cover a span of time from July 1953 to December 1958. Were any articles printed prior to this time? If so, what are they and are they available? Do these five pamphlets include all articles printed from July 1953 to December 1958?

"From my partially complete file it would appear that another series has been completed covering the design of concrete footings, walls and columns. Is this pamphlet available? If so, please send the necessary information in order that I may obtain a copy." *From R. P. Gross, Design Engineer, Armour Agricultural Chemical Co., Atlanta, Georgia.*

▶ To answer the first question, there were no Construction Briefs printed before July 1953. As to the question about the series on concrete footings, walls and columns, this is just being reprinted and will be available shortly. It is identified as Part 6. For the benefit of other readers who may be interested in this series of booklets, Booklets I through IV, covering various phases of Structural Design of an Industrial Building, are available at 50 cents per booklet. Booklet V on Reinforced Concrete and Booklet VI on Concrete Footings are available at 75 cents each. Readers interested in obtaining any one of these booklets or the complete set of six, at a cost of $3.50, can indicate the booklets desired on the post card in this issue or write to the Editor, PLANT ENGINEERING, 308 E. James St., Barrington, Ill.

For more facts circle 523 on Reply Card ⟶

a good name in industry

For more facts circle 521 on Reply Card

Process air handling . . . part of

Air-Lift† for industrial plants

Air-Lift is a new concept of coordinated products and services from American-Standard Industrial Division. Working to help you raise the efficiency of industrial plants through better control of inplant environment, Air-Lift offers you a single source for all types of process air handling, ventilation, and makeup fan equipment.

← Lift the flap

†Service-mark of American Radiator & Standard Sanitary Corporation

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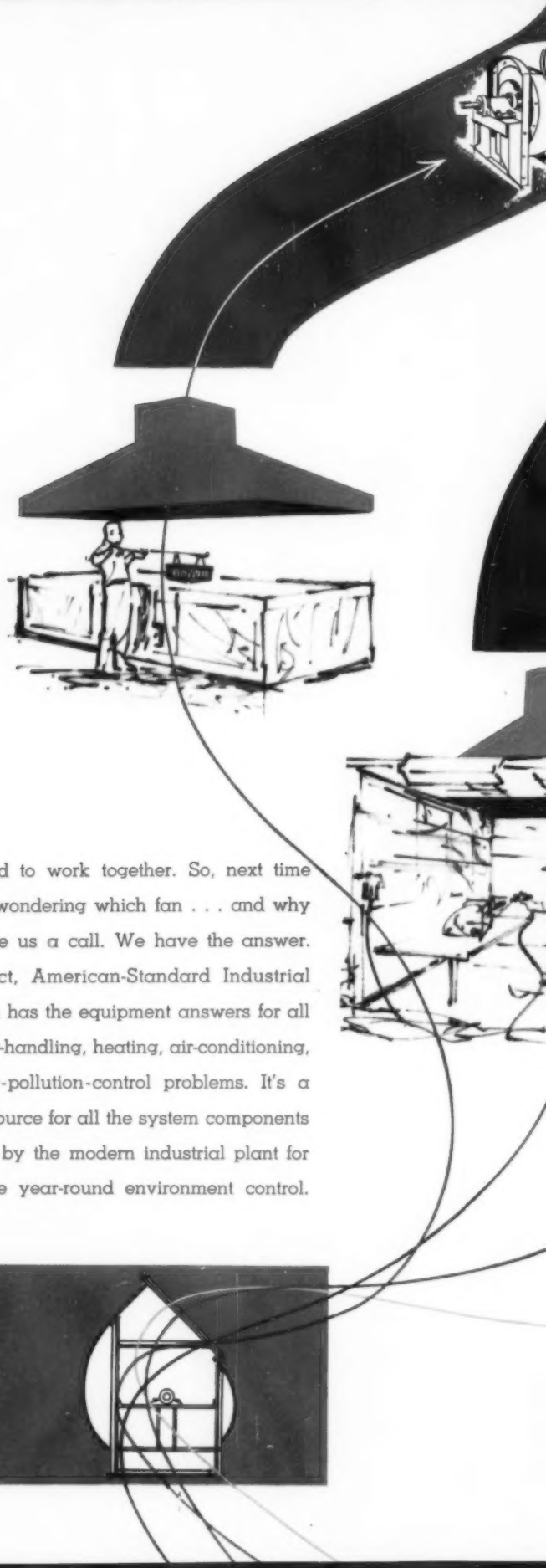
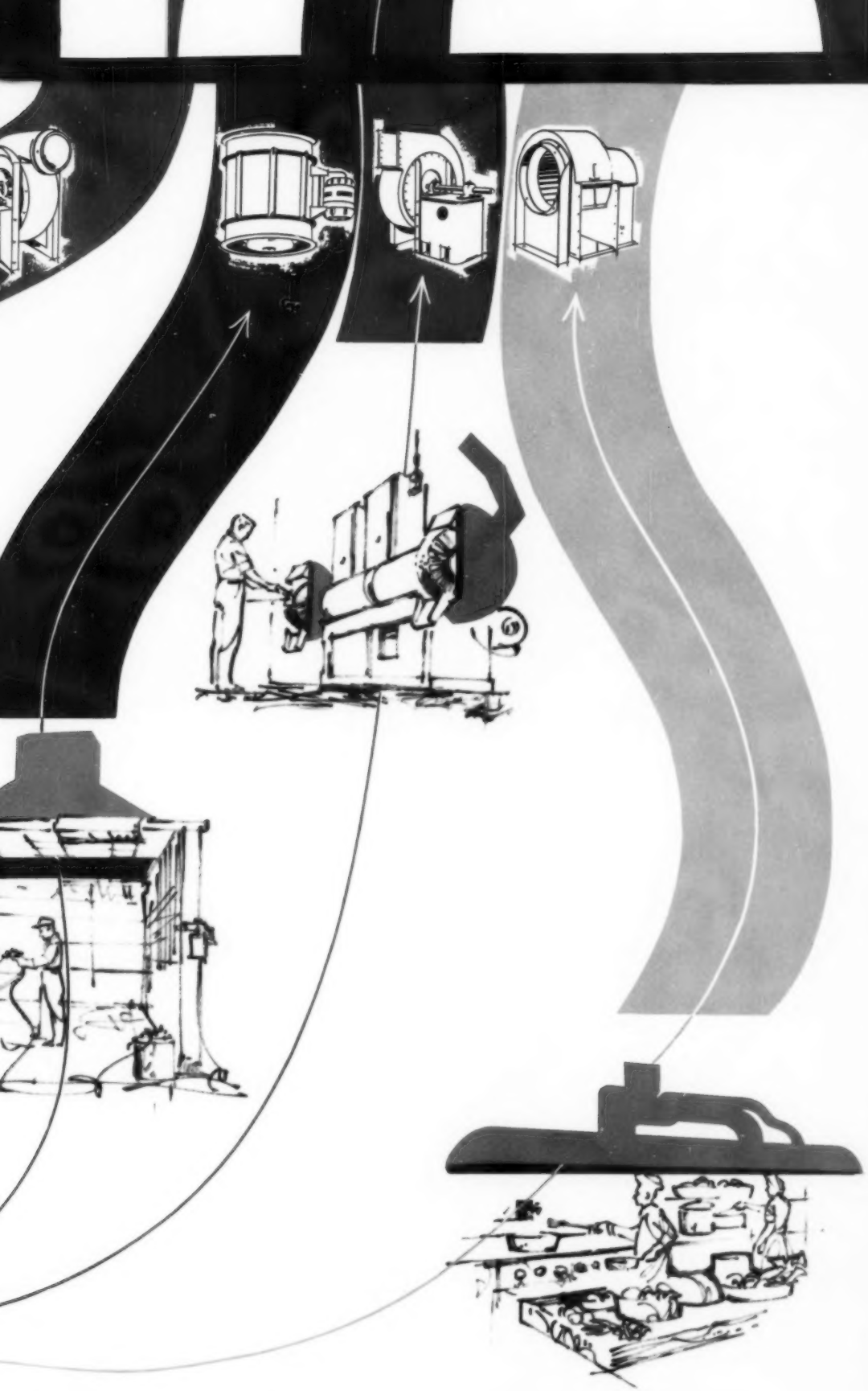
Knowing which fan and why

is the secret of efficient air handling for industrial plants. That's where we come in. Whatever the process, contaminant, or size of the plant, we can offer you the right fan for the duty and tell you why it's right. The reason: We make standard and custom fans for every type of industrial duty — rugged fans that give top efficiency with minimum maintenance. And obtaining all your air-handling components from a single source makes things more convenient for you. You nail down responsibility for delivery, performance, service. You save hours of interview time. You work with experienced product specialists who can give you the very latest in fan developments along with special equipment information. Also, you get an integrated system, because the units are designed to work together. So, next time you're wondering which fan . . . and why . . . give us a call. We have the answer.

In fact, American-Standard Industrial Division has the equipment answers for all your air-handling, heating, air-conditioning, and air-pollution-control problems. It's a single source for all the system components needed by the modern industrial plant for complete year-round environment control.



American-Standard Industrial Division
Air-Lift in action



↑ *Corrosion-resistant Type "V" fans, available with a great variety of special coatings* ↑ *Axial fans designed for processes requiring straight line air flow* ↑ *Industrial fans with wheel types for handling air, fumes, and gases or materials* ↑ *Utility sets in a wide range of capacities for supply or exhaust* ← *HS fans with single or double inlet wheels for makeup air systems.*

One-source responsibility. . . the heart of American-Standard Industrial Division's Air-Lift Service. Now — with the combined American Blower, Ross Heat Exchanger, and Kewanee Boiler product lines—American-Standard* Industrial Division offers all the major components for complete, integrated systems to control inplant environment. You benefit by getting air-conditioning, air-handling, heating, and air-pollution-control equipment designed, engineered, and manufactured to work together. And, most important, you have one-source responsibility for its quality and performance. Offices in all principal cities are staffed by product specialists whose practical knowledge of equipment selection and application may prove most helpful to you. American-Standard Industrial Division, Detroit 32, Michigan. In Canada: American-Standard Products (Canada) Limited, Toronto, Ontario. Export Division, American-Standard, New York City.

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Air conditioning — Centrifugal refrigerating machines Central station units • Fancoil units Self-contained air conditioners • Package water chillers • Multi-zone air conditioners • Sprayed coil dehumidifiers Heating and cooling coils • Air washers

Air handling — Industrial fans with wheel types for handling air, gases, materials, and shavings • Centrifugal, propeller, tubeaxial, and vaneaxial fans • Utility sets Power roof ventilators • Centrifugal compressors • Specialized fans, blowers

Heating — Firebox, scotch-type steel boilers and package units for heat, process steam Vertical, horizontal unit heaters for steam, hot water • Heavy-duty heating coils • Industrial unit heaters • Heating and ventilating units • Cabinet heaters

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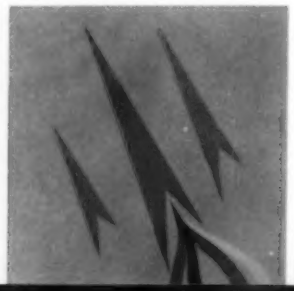

Plexiglas glazing could have prevented this replacement cost!

The high cost of replacing broken windows can be reduced sharply by installing PLEXIGLAS® acrylic plastic glazing. This breakage-resistant material takes the hazard out of your windows, transoms, doors, skylights and partitions. Install PLEXIGLAS and watch costs come down while safety goes up. Call your nearest Authorized PLEXIGLAS Distributor for advice and service on crystal clear or tinted and translucent colored sheets. He is listed under PLEXIGLAS in the Plastics section of telephone directories in major cities.

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NOW! Fuses that...

Safely interrupt fault currents up to 200,000 amperes...

Limit fault current to very low values

Hold 500% load for minimum of ten seconds

Buss Low Peak fuses can completely revolutionize the protection of the entire electrical system.

Protect Mains, Feeders, Branch Circuits, Motors, Controllers, Switches—no matter whether the fault current is 1,000 amperes, 25,000, 100,000—or as high as 200,000 amperes.

Reduce stresses and prevent damage to Panel-boards, Switches, Motor Controllers—other circuit components—because let-thru fault currents are limited to exceptionally low values.

Prevent work stoppages, lights out, waste of time and money—because long time-lag keeps them from opening needlessly on motor starting currents or other harmless overloads.

Permit increasing interrupting capacity and current limitation on present system at minimum cost.

Before designing a new installation— or modernizing old installations—

GET ALL THE FACTS

Knowledge without action is of little value—but ACTION NOW may save you money—increase operating efficiency and reduce electrical hazards to a minimum.

BUSS LOW-PEAK fuses fit standard Switches and Panel-boards and are available in N.E.C. sizes from 15 to 600 amperes in both 250 and 600 volt ranges.

Write for BUSS LOW-PEAK Bulletin Now . . . or use coupon.

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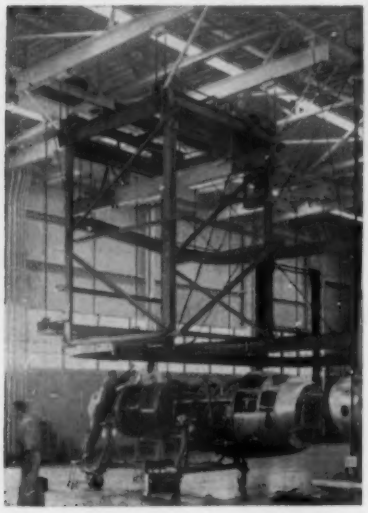
PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Lift Tower for Jet Engines

A THREE-LEVEL lift tower plays a key role in the monorail system in United Air Lines new jet engine overhaul base at San Francisco, Calif. Engines used by the airline on jet airliners are completely overhauled after every 800 hours of flight. Following disassembly, cleaning and inspection, the reassembled engine is hung on an overhead monorail in the same manner as it is suspended in flight, providing easy accessibility.

Prior to the final test run, the



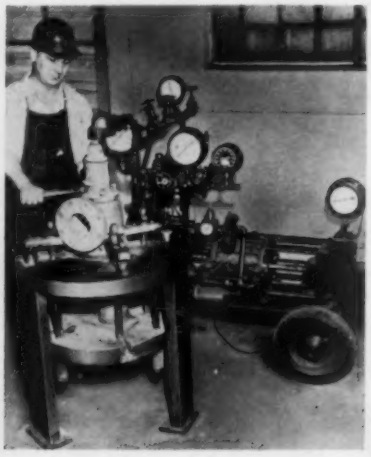
Specially designed tower lift handles jet engines at United's overhaul base.

engine is moved into the specially designed lift tower in which four, 14-ft screws provide a level lift of five-ton capacity. After lowering the assembled engine to the carrying dolly, the tower lifts the load bars to the upper rail, then the tractor pushes load bars onto a return rail for storage at the beginning of the system. *From a release of Twin City Monorail Co., Minneapolis, Minn.*

Portable Pump Rig

A PORTABLE PUMP rig which speeds up the hydrostatic testing of valves and other equipment has been built by the maintenance staff at the East St. Louis refinery of Mobil Oil Company. The unit is used throughout the refinery, wherever water and air connections are available.

The hydrostatic test unit consists of a horizontal air-operated hydropneumatic pump with a rated capacity of 7330 psi, mounted on a



Turn of valve creates hydrostatic test pressure for spotting leaks and for recalibration of the relief valve springs.

rubber-tired cart. This pump supplies hydrostatic pressures ranging from 250 lb to 2500 lb, and is operated by plant air at 90 psi.

The portable pump is used mainly at "turn-around" time when refinery units are dismantled, inspected, and restored to optimum working order. Many valves are inspected, rebuilt if necessary, and then tested for leaks under hydrostatic pressure. Relief valves, in addition, are hydrostatically tested for correct operation.

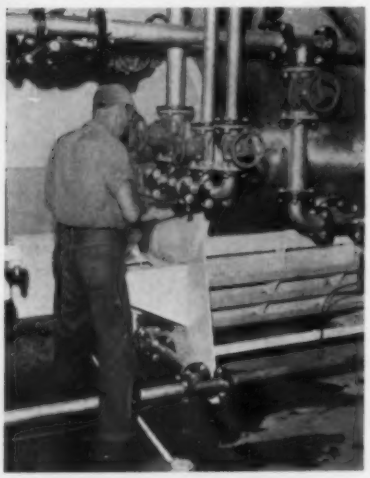
In the valve repair shop, the portable pump is connected to a test stand on which the valves are mounted. Hydrostatic pressures ranging from 125 to 250 psi are then created. This enables the maintenance staff to spot leaks instantly and adjust relief valve springs to precision settings for specific design pressures.

The portable pump is also used for hydrostatic testing of heat exchangers before they are returned to service. Without disturbing piping arrangements, the unit quickly supplies hydrostatic pressure to meet Mobil's test specification—such as holding 500 psi for one half hour.

A major benefit provided by the portable pump is fast operation. Since it is air-operated, pressure is built up to the required level in only seconds. When a number of valves are to be tested, this means a tremendous increase in speed over hand pumping and a great saving in testing time. *From a release of Aldrich Pump Co., Allentown, Pa.*

Stainless Piping System Is Lightweight, Easily Handled

AN UNUSUAL all-flanged piping system serves a new chill-filtering process now in operation at the main



Light-wall stainless steel piping system with 300 rolled-in joints was used for chill-filtering process. Chilled whiskey passes through filter at 60 to 65 psi.

plant of Glenmore Distilleries Company in Owensboro, Ky.

Light-wall stainless steel pipe, joined with labor-saving rolled-in flange connections and tangential fittings, helped Glenmore meet problems of cost, installation, operation and maintenance.

Glenmore's new chilling and filtering unit is used for the final step

(Continued on page 46)

CROUSE-HINDS

EV Series
Explosion-Proof
Lighting Fixtures

Highest Efficiency . . . Easier to install, relamp, maintain . . .

The EV series offers exactly the right fixture for any area made hazardous by flammable atmospheres of vapors or gases, as defined under Class I of the National Electrical Code.

Basic EV Incandescent Fixtures
(Groups C & D)

are of strong, shock-resistant construction, contain internal explosions without rupturing. Threaded joints are flame-tight . . . no sealing compound required on installation. Gas tightness not required for safe operation . . . just turn off line current when relamping. Maximum corrosion-resistance. 75-500W.

EVA Incandescent Fixtures
(Groups A & B)

comprise the first complete, UL-approved lighting system for acetylene and hydrogen locations. Lamp and wiring compartments are separate and individually explosion-proof. 150-300W.

EVA Mercury Vapor Fixtures
(Groups C & D)

provide important operating economies in hazardous areas: *2.5 times more light output per Watt* than incandescents . . . greatly reduced frequency of relamping. 250-400W.

For Complete Information on Crouse-Hinds explosion-proof lighting equipment, call your Crouse-Hinds distributor, or write us. EV Lighting Fixtures are available in all reflector types: Holophane Prismatic (illustrated); slotted dome and angle; and conventional (unslotted) in all shapes and sizes.

CROUSE HINDS
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PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

in processing bourbon whiskey before bottling. Operating at 300 gph, the unit chills the product to below 0 F and pumps it at average pressures of 60 to 65 psi through vertical stainless steel mesh filter sheets holding a filtration pad formed of diatomaceous earth.

Requirements for this type of installation include long piping life and maximum purity, and easy dismantling for flushing. The latter operation is necessary because of the tendency of diatomaceous earth to get into the piping system during jet-washing at the end of a processing cycle.

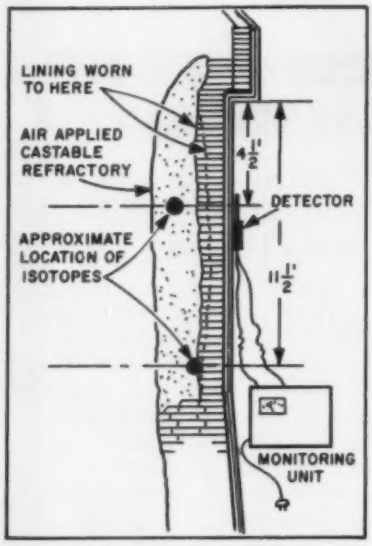
Glenmore specified stainless steel, but called for pipe and fittings in light-wall thicknesses. An all-flanged design was specified to provide for ease of assembly and dismantling.

All-flanged assembly was accomplished by means of pipe with tangents that permit fabrication of flanged fittings, and a "rotating flange insert" that permits labor-saving rolled-in flange connections. There are 300 such joints in the new Glenmore installation. Of these, according to Plant Engineers Ed Morton and Dan McCarroll, only two (less than one per cent) showed any signs of leakage after initial installation and the system has performed beyond expectations since it was placed in operation. *From a release of Tube Turns Div. of Chemetron Corp., Louisville, Ky.*

Check Furnace Lining With Aid of Isotopes

TO FIND out how well a patch on the lining of one of our blast furnaces is holding up, several sources of Cobalt 60 were placed in the patch.

The castable used for repairing the furnace was sprayed on in horizontal layers. At the three upper locations in which the isotopes were placed, the castable was removed to make a shelf at a level an inch or two above the plane of the isotopes, then a bar was used to make a hole in the horizontal surface at the prescribed distance and depth to the plane. The isotopes were removed with forceps from their shielded containers and dropped into the hole which was immediately packed with castable. The shelf was built back to its original size, giving at least 12 in. of castable over the isotopes.



Placement of Cobalt 60 isotopes permit continuous check to be made on lining.

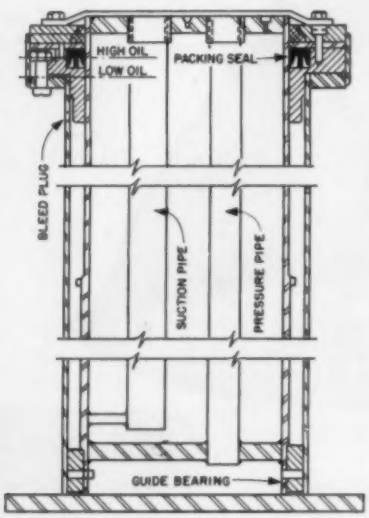
Isotopes were placed in the lower part of the furnace lining by working from outside it. Holes were cut

(Continued on page 48)

Electric Mixer for Paints, Plastics Is Controlled by Specially-Designed Hydraulic Cylinder

A KING-SIZE electric mixer consisting of a 25-hp electric motor, a conical speed reducing apparatus and an impeller blade, is being used by the Farboil Co., Baltimore, Md., for mixing paint and other materials.

Operator uses pushbutton controls to raise and lower lift, start, stop blade.



Drawing shows how space inside cylinder plunger is used for oil reservoir.

Electric motor and oil pumping mechanism is contained in a stainless steel and wire mesh box-like enclosure. The unit weighs approximately 800 lb.

The mixing mechanism is raised, lowered and swiveled around on a hydraulic cylinder base which is a specially designed ram utilizing the inside area of the plunger as an oil reservoir. The weight supported by the plunger is evenly distributed over the length of the rectangular container, providing a balanced load over the power cylinder.

The mixer is used for processing paints, plastics, emulsions, soaps, etc. Wheel-mounted portable tanks of 200- to 300-lb capacity are rolled to the side of the mixer, which is raised and swiveled so that the impeller blade is immersed in the liquid. Speed of the blade can be varied between 1500 rpm and 6000 rpm. *From Lift, published by Globe Hoist Co., Philadelphia, Pa.*

In goes Solnus . . . out goes compressor trouble

By using a Sun Solnus oil, this man is eliminating dangerous carbon build-up—the chief enemy of compressors and the cause of most maintenance shutdowns.

Solnus oils have proved to be ideal compressor lubricants. They form very little carbon . . . and what does form is a soft and fluffy kind that blows away easily from valves and exhaust parts. Because carbon does not build up, ring grooves and air lines stay clean.

With freedom from carbon build-up, operators are assured of peak compressor efficiency for months and sometimes years. Maintenance costs go down and stay down. In short, with Sun Solnus oils you get all the special benefits of quality . . . the best economy of all!

For the full story about the extra benefits of Solnus oils, see your Sun man, or write to SUN OIL COMPANY, Philadelphia 3, Pa. Dept. PY-7. In Canada: Sun Oil Company Limited, Toronto and Montreal.

SUNOCO

MAKERS OF FAMOUS CUSTOM-BLENDED BLUE SUNOCO GASOLINES

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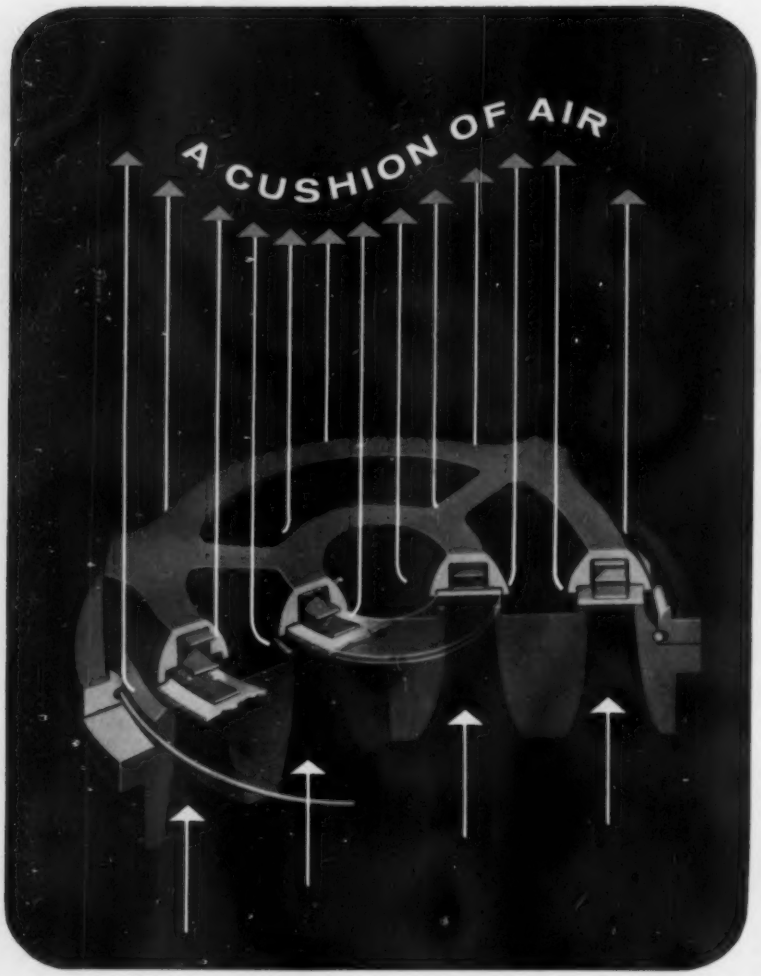

makes PENNSYLVANIA COMPRESSORS run efficiently...silently...with minimum maintenance. Stainless steel valve discs lift against a cushion of air in the simple, efficient design of the Air Cushion Valve that makes PENNSYLVANIA Compressors run so silently, so dependably, and with such low maintenance requirements. Air Cushion Valves have no nuts, bolts, or screws to break or burn fast. You get longer valve life . . . eliminate wear . . . eliminate noise caused by metal striking metal. Flat valve discs have no flexing or bending action to weaken or distort them; they remain perfectly flat and tightly seated over long periods of service.

But this is only part of the PENNSYLVANIA story. Learn all the facts in "Compressors For Industry." It describes PENNSYLVANIA Compressors from 10 to 350 hp, horizontal, angle, and OILFRE models. Write to Dept. A-7 for your copy today.

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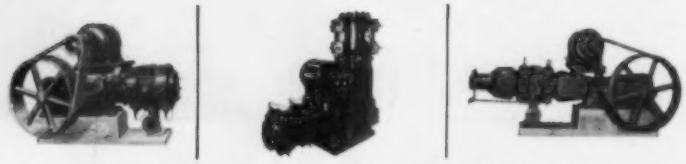
PUMP AND COMPRESSOR COMPANY
Easton, Pa. • Earning Customer Confidence Since 1920



For more facts circle 528 on Reply Card

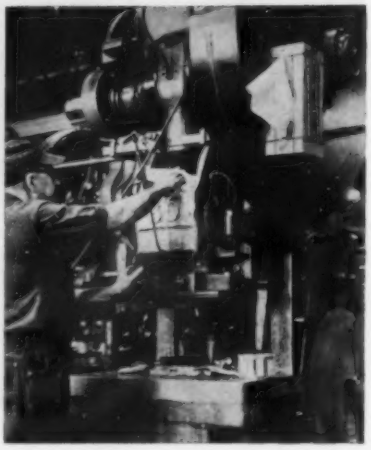
PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

through the steel shell with diamond drills, then a pipe coupling was welded around the hole in the shell. Each isotope was placed in a small ball of the refractory and pushed to the end of the hole. After the holes had been tamped full of the castable, pipe plugs were screwed into the couplings to seal the shell.

Geiger tubes and a three-channel monitor will enable a check to be kept on the isotopes from outside the furnace. A sudden drop in radiation count would indicate when one, or several isotopes had been torn loose from the patch on the furnace lining and carried down the stack with the burden. *From CF & I Blast, published by The Colorado Fuel and Iron Corporation, Pueblo, Colorado.*

For Improved Housekeeping



Use of disposable paper wipers has reduced plant wiping costs, improved housekeeping at Caloric Appliance Corp., Topton, Pa. Wipers are placed in holders at each machine. (From a release of Scott Paper Co., Chester, Pa.)

Color Control of PVC

A PROBLEM OF achieving color control of extruded polyvinyl chloride was solved by the installation of six volumetric, dry material feeders at the plant of National Electric Division H. K. Porter Company, Ambridge, Pa.

Previously, the color chips were added by hand to 250-lb drums of the natural-color PVC. All of it was

Cedarapids Super Commander Portable Crushing and Screening Plant, built by Iowa Manufacturing Company, Cedar Rapids, Iowa, produces up to 500 tons per hour of crushed and screened material in four different product sizes.

This high capacity V-Belt Drive handles

60% more power in 30% less space!

Higher Capacity of Gates Super HC V-Belt Drives solves complex product-development problem!

In developing a larger crusher, requiring more horsepower, Iowa Manufacturing Company was faced with the problem of transmitting 400 hp from a higher-speed engine in a space that had been just enough for conventional V-belts carrying 250 hp.

At the higher speeds, centrifugal force made it impossible to go to larger sheave diameters to accommodate larger belt sections. A wider span of belts was ruled out by Highway Department requirements, which restricted overall machine width to eight feet.

Iowa Manufacturing's designers solved their primary problem of transmitting 60% more horsepower with new Gates Super HC V-Belts.

Because Super HC V-Belts have smaller cross section, use narrower and lighter-weight sheaves, pack higher hp capacity in a smaller 'package' than conventional V-belts, designers also succeeded in reducing drive weight, width and height — a decided bonus in equipment that must be moved frequently both on and off the highway.

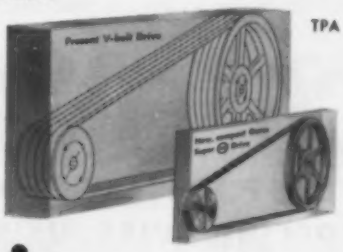
Nation-Wide Engineering Service

There's a Gates Distributor nearby to show you how to reduce drive weight, space and cost with Super HC V-Belt Drives. With Super HC, sheave diameters can be reduced 30% to 50%, drive space up to 50%, and drive weight 20% or even more.

Ask your Gates Representative for your free copy of "The Modern Way to Design Multiple V-Belt Drives," or write to The Gates Rubber Company Sales Division, Inc., Denver, Colorado.

The Gates Rubber Company, Denver, Colorado
Gates Rubber of Canada Ltd., Brantford, Ontario

Gates *World's Largest Maker of V-Belts*



TPA 503A

Gates Super HC V-Belt Drives

same hp capacity in smaller "package"

For more facts circle 529 on Reply Card

Again Coffing Brings You a New Line of Hoists

For the second time in less than a year Coffing has introduced a new hoist line to give you easy, safe, positive efficient lifting power at moderate cost.

The new RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is easy to operate—requires minimum handle pull—only 59 pounds for the ¾-ton model to 97 pounds for the 6-ton model. It may be operated from either side and the design prevents freezing a load. Load rotation is easy because of ball thrust bearings in the load hook assembly.

Safety has been built into the hoist. It will not ratchet under load if handle is released nor will it free chain. Controls are protected from inadvertant shifting. The bottom stop eliminates any hazard from the handle being released unintentionally and prevents handle from being moved to a position parallel to the load chain which would develop undesirable twisting action. The exclusive safety handle bends to indicated overload.

Strength without excess weight in the new hoist is achieved by a special aluminum alloy which is used in the body and handle. Long service life has been provided by the high tensile material in the chain retaining guide, heat treated load sheave and the plated, high tensile, heat treated alloy steel link chain. Maintenance is held to a minimum by the rugged construction and simplicity of design.

The new Coffing RA Series Safety Pull Aluminum Ratchet and Pawl Lever Hoist is available in six models with capacities from ¾ to 6 tons. Ask your distributor or write for Bulletin ADH-86.

COFFING HOISTS

DUFF-NORTON COMPANY

COFFING HOIST DIVISION • Pittsburgh, Pa.

COFFING HOISTS
Ratchet Lever • Air
Hand Chain • Electric

DUFF-NORTON

DUFF-NORTON JACKS
Ratchet • Screw
Hydraulic • Worm Gear

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PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

Color chips are fed volumetrically by vibratory screw feed to natural PVC, ensuring even distribution of color unit.

tumbled then shoveled into the hopper of the extruder.

More than one third more chips were being added than were required, resulting in uneven color density and possible varying uniformity in dielectric strength of the PVC which was being used as insulation on wire.

Metering by volume, the volumetric feeders, installed adjacent to the vibrating conveyor trough which moves the PVC into the extruder, supply a predetermined amount of coloring material to a batch of PVC either continuously or by programmed cycles. National Electric is saving more than $5000 a year in color chip and labor costs by employing this method. *From a release of Vibra Screw Feeders, Inc., Clifton, N.J.*

Neoprene Reduces Separator Maintenance

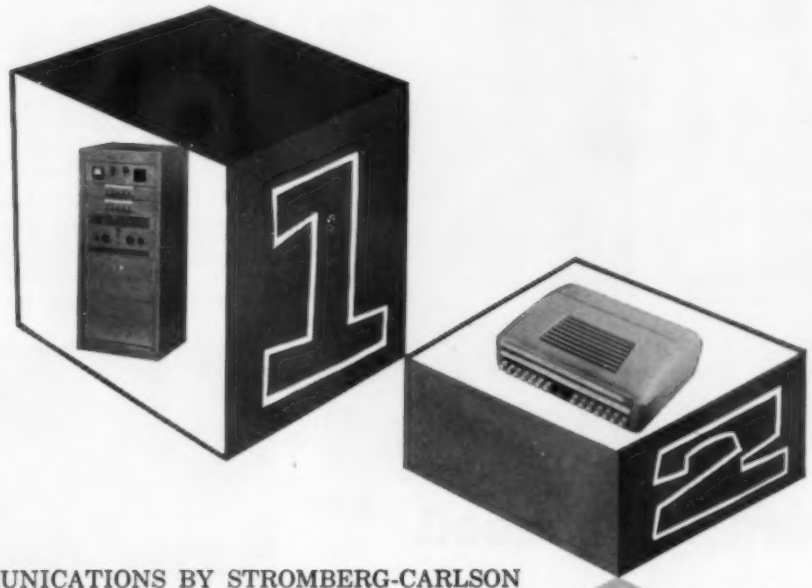
A CEMENT COMPANY installed a battery of vibratory separators two or three years ago to improve production rate. The separators are used in the early stages of manufacture of Portland cement, screening 70 per cent limestone, 30 per cent clay slurry which is milled until it passes through a 24 mesh.

After a few months of operation, the metal rims of the separators were wearing through and leaking. Rapid vibration was not only speed-

ONE OF THESE SYSTEMS (OR A COMBINATION) MAY BE EXACTLY WHAT YOU NEED:

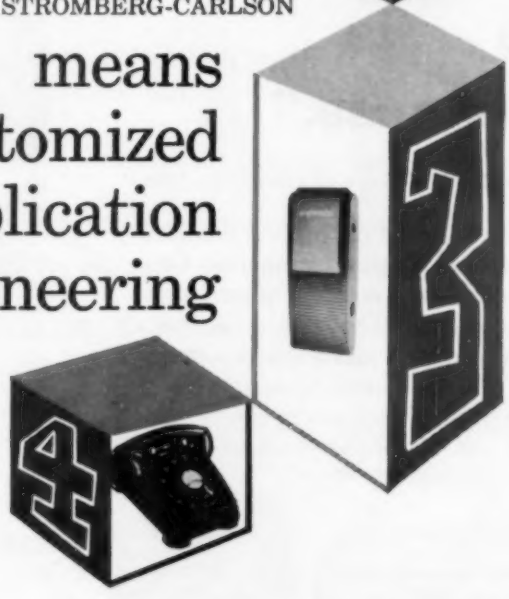
1. Typical "customized" paging or background music system—one of many possible arrangements of standardized components. **2.** "Key-municator"* loudspeaking intercom system is another Stromberg-Carlson aid to efficient operation. **3.** A Pagemaster® selective wireless paging system may best meet the requirements of your operation. **4.** A flexible, expandable Dial-X® private telephone intercom system can be tied to a paging system or used independently.

*Trademark



COMMUNICATIONS BY STROMBERG-CARLSON

means customized application engineering



The communication needs of your plant are very special. No existing "packaged" system meets your specific needs.

How do you get a made-to-order system at a ready-made price—a system without installation and maintenance complications?

The answer: Stromberg-Carlson's concept of customized application engineering using STANDARDIZED components.

We have the basic building blocks. We can assemble them for your specific application, and provide a system that installs easily, insures against obsolescence, gives you top reliability with minimum maintenance and service.

The authorized Stromberg-Carlson distributor in your area is a qualified communication consultant. Let him study your operation, pinpoint your needs, and show you how Stromberg-Carlson can meet them.

Look in the Yellow Pages under "Public Address & Sound Equipment," or write to Commercial Products Division, 1415-07 North Goodman Street, Rochester 3, New York.

"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON

A DIVISION OF **GENERAL DYNAMICS CORPORATION**

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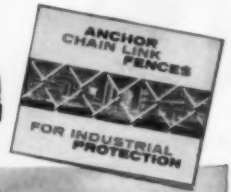
"Customers' increased confidence . . . is helping business."

HARTFORD DESPATCH & WAREHOUSE CO., INC., Cambridge, Mass.

"A new Anchor Fence really makes a difference! We have Anchor at all four of our New England branches. Customers' increased confidence in the security of our warehouse facilities is helping business. The neat appearance of the fence spruces up the property and attracts customers. We are able to store materials outside *safely*—a real saving. There has been a definite increase in safety, too. We can control traffic in and out of the plant as well as establish traffic lanes at the property."

For more information on how Anchor Fence can help *your* operation, call your local Anchor Man. Write for *free* catalogue to: ANCHOR FENCE, 6661 Eastern Ave., Baltimore 24, Md.



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Division of ANCHOR POST PRODUCTS, INC.®

Plants in Baltimore, Md.; Houston, Texas; and Whittier, Cal. • Sold direct from factory branches in all principal cities.

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PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

ing the screening rate but also the metal abrasion by the sharp limestone particles.

The units were lined with ⅛-in. thick neoprene vulcanized sheet to prevent abrasion. Now, the mill gets at least six times the previous three months' service life of bare metal rims. An inspection 17 months after installation, showed that while the neoprene surface was

Neoprene linings on rim of vibratory separator have reduced maintenance.

worn, it was still in satisfactory condition to handle slurry 24 hr a day, seven days a week. Neither the neoprene lining nor the separator has required maintenance during the 17 months' use. *From Elastomers Notebook, published by Elastomer Chemicals Department, E. I. du Pont de Nemours, and Co., Inc., Wilmington, Del.*

Dryer Corrosion Problem Solved

AT ONE STAGE in a process at an Eastern plant, inorganic materials, wet with hydrochloric acid, are treated in a drum dryer where they are subject to air heated to 225 F. Vapor, composed of free hydrochloric acid and water, passes through the exit housing for separation from the material being dried. Severe corrosion resulted, causing equipment damage and product contamination.

To combat this corrosive condition, a completely new dryer was fabricated of fiber glass reinforced polyester resin. The unit includes

WRITE FOR THIS NEW BROCHURE..... TODAY!

TECHNICAL BULLETIN ON INSULATING HEATED STORAGE TANKS SHOWS YOU . . .

- An easy way to figure how many btu's (and dollars) are now being wasted by your uninsulated tanks, vats and vessels.
- Latest lower-cost techniques of insulating large and small tanks.
- Why ULTRALITE, far more effectively than any other insulation, meets *all* the requirements for permanent and economical tank insulation.
- Why ULTRALITE-insulated tanks usually require *not one penny of maintenance* over the years!
- How ULTRALITE glass fiber insulation literally pays for itself . . . in some cases in just 6 months by saving over 90% of the heat now being wasted!

The new 8-page ULTRALITE Tank Insulation Brochure, we believe, offers the most comprehensive and current information available on the who-what-why-when-and-how of insulating tanks. Your free copy is available for the asking—just write today.

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Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation
Couplings and fittings for plain and grooved end pipe

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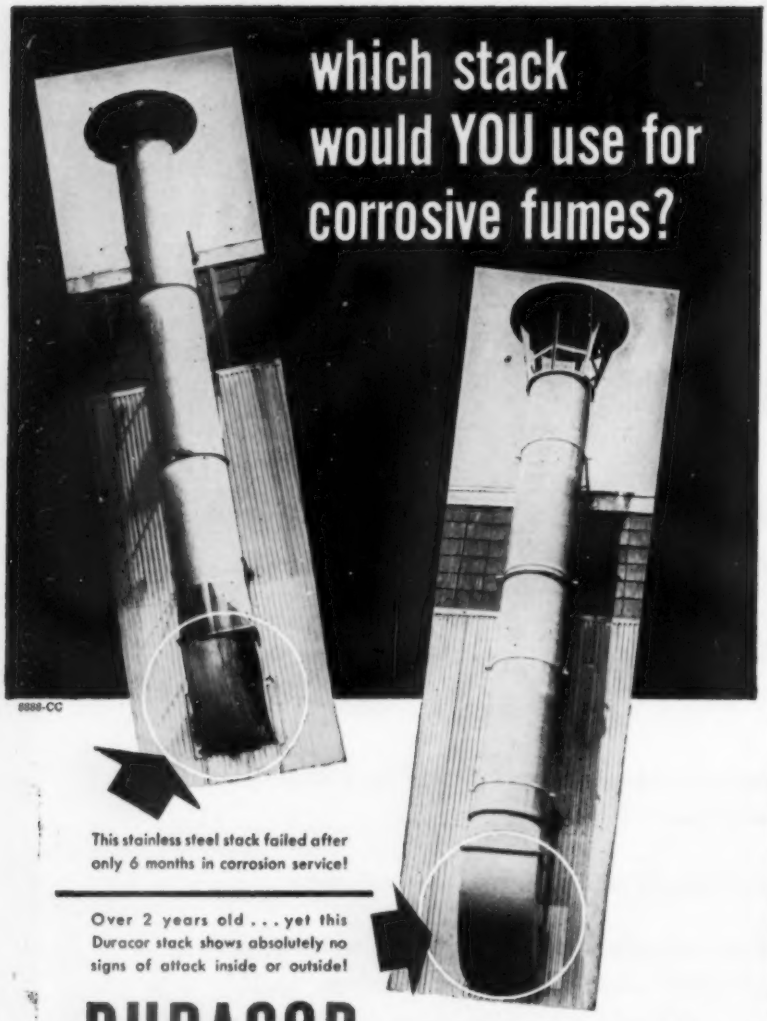
which stack
would YOU use for
corrosive fumes?
8888-CC
This stainless steel stack failed after only 6 months in corrosion service!
Over 2 years old . . . yet this Duracor stack shows absolutely no signs of attack inside or outside!

DURACOR VENTILATING SYSTEMS PROVIDE LASTING CORROSION RESISTANCE AT LOW COST!

Performance-proven Duracor Ventilating Systems and components provide outstanding resistance to attack from all types of corrosive fumes. These high-strength systems are corrosion-proof throughout . . . are practically immune to weathering . . . require only minimum support! Best of all, Duracor construction can save you up to 30% on your initial investment . . . and it's maintenance-free! Ceilcote engineers will design a complete Duracor system to meet your special requirements . . . or modify your present system to permit gradual conversion to Duracor. Fabricated to meet customer specifications . . . or assembled from stocked component parts . . . Duracor Ventilating Systems can be easily installed by regular plant maintenance crews or by experienced Ceilcote inscallation personnel. Write today for the new Ceilcote catalog.

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THE CEILCOTE COMPANY, INCORPORATED

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For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 44)

the exit gas separator housing, gas entrance and product discharge housing and internal dryer lifting flights.

After six months' service, the dryer shows no sign of corrosion, interior surfaces reflect only negligible wear by erosion of the solids being dried and the product remains uncontaminated. *From a release of Hooker Chemical Corp., Niagara Falls, N.Y.*

Data Processing Program Integrates Production

USE OF Management Operating System techniques is producing savings of $120,000 a year in production costs for American Bosch. A random access data processing system is the tool with which this is being accomplished.

American Bosch, a division of American Bosch Arma Corp., developed the program to automate planning and scheduling of piece part material control. This program is carried out by an IBM RAMAC 305 electronic data processing system without human intervention.

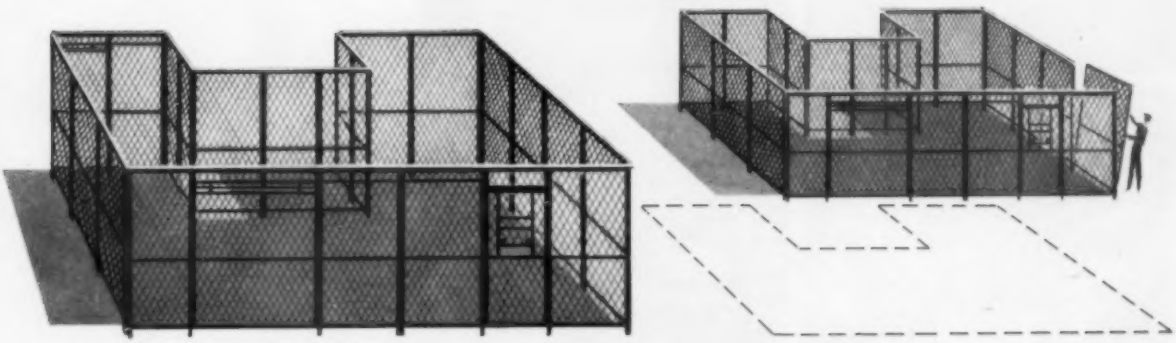
It is a regular daily occurrence at American Bosch to activate the complete processing of a production schedule order with a single punched card.

Accepting the card, the computer scans a magnetic disk file containing 10 million characters of information and establishes the time relationships needed to obtain or produce each component of the finished product.

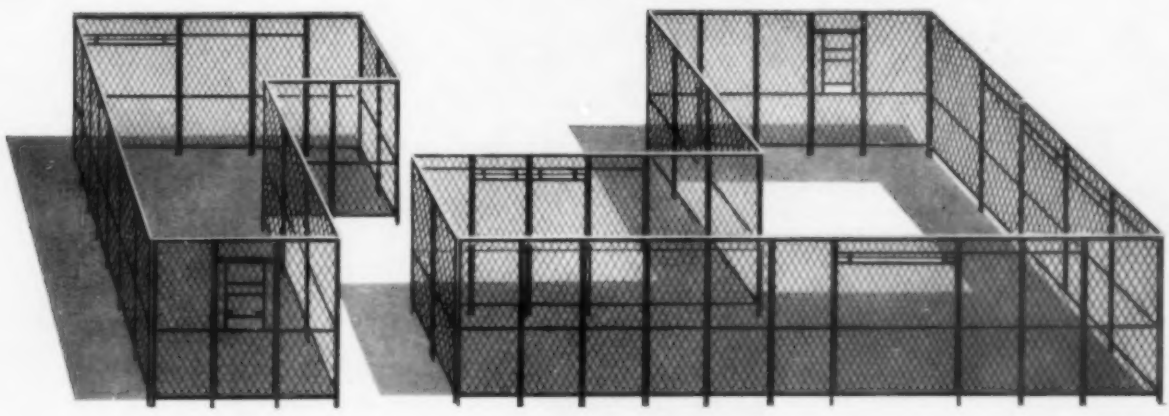
Within three minutes, the computer can determine the effect of the order on all 15,000 parts which go into the company's 1000 end products. Components are allocated from stock or scheduled for production in economical quantities by the RAMAC 305.

Production schedule changes now can be entered into the system immediately with a substantial reduction in the time required under the previous system. *From a release of International Business Machines Corp., Data Processing Div., New York, N. Y.*

EXPANDED METAL PARTITIONS BY WHEELING



Here's the partition system... you can move...



or rearrange... or enlarge!

Want effective partitions that will help keep your plant layout flexible? Then look what Wheeling Expanded Metal Partitions offer!

STANDARDIZED PARTS let you move doors and panels quickly and easily...even change entire layouts without buying new components.

FAST DELIVERY because Wheeling makes and stocks America's most complete standardized expanded metal partition systems.

THEFT PROTECTION because expanded metal is solid steel . . . can't be unraveled like wire mesh.

INCREASED SAFETY because expanded metal permits free passage of heat, air, light, fluids and sound.

Get the complete details on Wheeling Expanded Metal Partition Systems from your Wheeling man. Wheeling Corrugating Company, Wheeling, West Virginia.

WHEELING CORRUGATING COMPANY • IT'S WHEELING STEEL!

Immediate delivery on all stocked items from these warehouses: *Boston, Buffalo, Chicago, Columbus, Detroit, Kansas City, Louisville, Minneapolis, New Orleans, New York, Philadelphia, Richmond, St. Louis.* Sales Offices: *Atlanta, Houston.*

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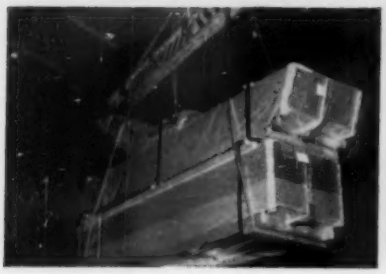


Tuffy has the right answers for every sling need

These three shots of Tuffy slings at work just begin to suggest the thousands of different jobs Tuffy does in hundreds of industries.

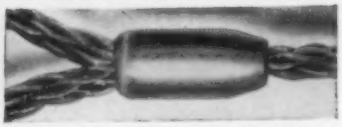
Tuffy slings, hoist lines and special-purpose wire ropes are tailored to every type use, every weight and shape of load, every set of working conditions.

How well do they do the job? Quoting a steel company official: "We are getting double the service life from our 1¼" 9-part machine braided Tuffy slings as we did from 6 x 37 rope type slings."

That's typical of many testimonials that praise Tuffy's combination of better performance, greater safety and longer service life you get from Tuffy products.

Why Tuffy serves you better and saves you money

Tuffy's Exclusive Fabric combines extra strength and extra flexibility to give you ultimate sling construction. It makes knotting and kinking next to impossible. If a kink should occur, it's easily smoothed out, leaving no permanent damage.



Pressed-On Streamlined Metal Ferrule gives the tucked eye splice 100% of fabric strength. It's applied under tremendous hydraulic pressure. Streamlining eliminates snags and projections that might injure hands or arms.

Get in Touch with Your Tuffy Distributor

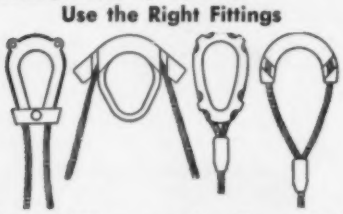
Whether your sling jobs call for machine-braided Tuffy slings or the new line of Union 6- and 8-part hand-braided slings, your Tuffy distributor can supply all your needs. His experience (and the counseling service of Union's branch office or factory staff) are yours to call on at any time. Look up your Tuffy distributor in the Yellow Pages.

Tuffy Tips —on safe use of Slings and Hoist Lines

How Much Lifting Should Be Done by Muscles?

Individual differences between workers make this a hard question to answer categorically. For a rule of thumb: United States Department of Labor recommends men should handle no more than 50 pounds; women no more than 25 pounds. Of course this is for men and women of average size and height, in normally good physical condition. To remove all doubt, mechanical lifting and hoisting equipment should be used for all loads not comfortably lifted by muscles.

Use the Right Fittings



Proper fittings can give slings added safety and service life. The sling eye is usually the point of greatest wear in load handling. The proper fitting acts as a shield to take the brunt of this wear. Shown above are some of the standard and advance type fittings. Left to right: (1) *Equalizing Thimble* permits adjustment of the sling leg lengths so irregular loads may be handled on an even keel. (2) *Newco Sling Bridle* will not slip when handling unbalanced loads. (3) *Newco Slip-Thru Thimble* allows passage of an identical thimble through its eye when a regular sling is used as a choker sling. (4) *Newco Slip-On Thimble* eliminates flattening or pulling together of eyes under heavy loads; can be attached or removed in seconds.

FREE!
New Tuffy Sling Handbook

All about slings from A to Z, including types, dimensions and rated loads. Address **Union Wire Rope Corporation, 2272 Manchester Ave., Kansas City 26, Missouri.** Specialists in high carbon wire, wire rope, braided wire fabric, and stress relieved wire and strand.

4

UNION Wire Rope

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OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
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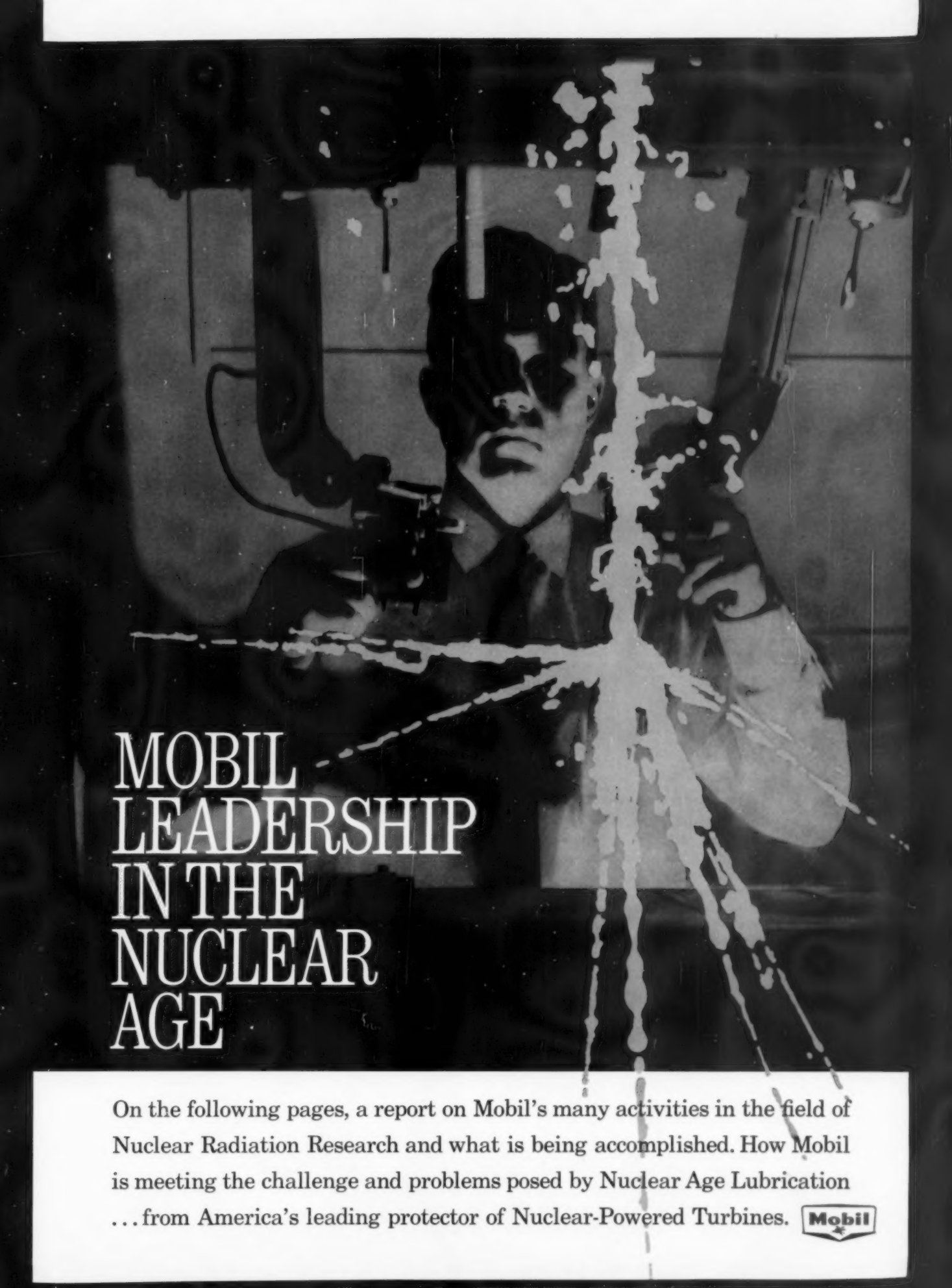
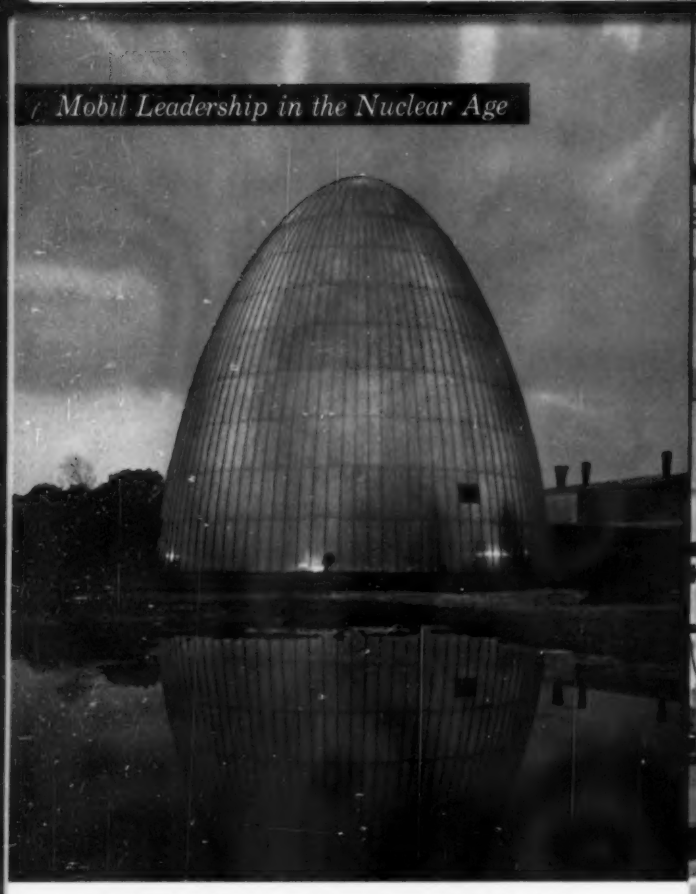


MOBIL LEADERSHIP IN THE NUCLEAR AGE

On the following pages, a report on Mobil's many activities in the field of Nuclear Radiation Research and what is being accomplished. How Mobil is meeting the challenge and problems posed by Nuclear Age Lubrication ... from America's leading protector of Nuclear-Powered Turbines. Mobil

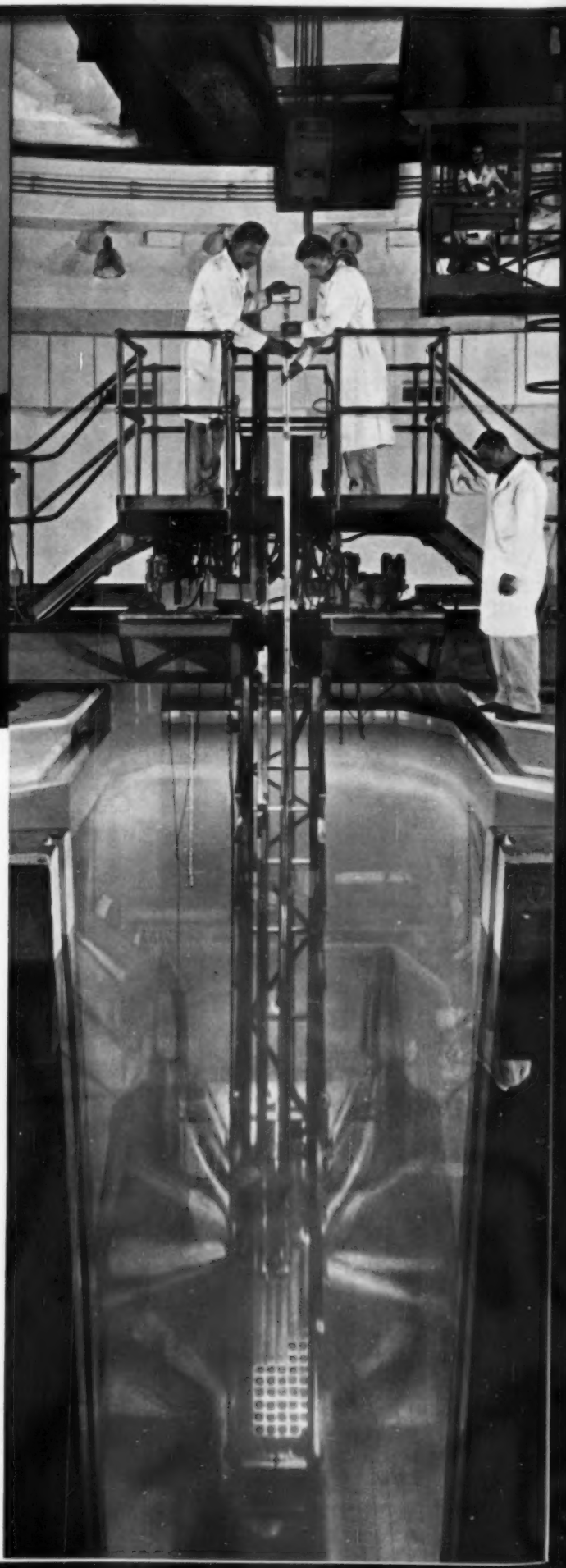
Mobil Leadership in the Nuclear Age



This unique dome-shaped structure houses the Industrial Reactor Laboratories Inc., where Mobil participates with companies from other areas of industry in nuclear research activities.

Mobil Nuclear Research

As a world leader in petroleum technology, Mobil is meeting the challenge of the Nuclear Age with facilities, programs and products. No one yet has all the answers. But Mobil Nuclear Research is opening many doors to future progress. For example, Mobil is part owner of one of the world's most advanced private nuclear research facilities, Industrial Reactor Laboratories in Plainsboro, N. J. Here a 5-million watt nuclear reactor is used to explore new refining techniques, the manufacture of petroleum chemicals, and effects of radiation on petroleum products. Mobil's own nuclear laboratory near Princeton, N. J. includes a 2-million electron volt particle accelerator and other advanced equipment to probe the atomic frontier. This research is yielding new knowledge, products and processes . . . and improved lubrication for Nuclear-Powered equipment.



View of 5-million watt swimming-pool-type reactor used by Mobil at IRL. Primary purpose is to provide source of neutron and gamma rays for experimentations. Mobil scientists use this radiation source to develop new petroleum products and chemicals.

2-million electron volt Van de Graaff accelerator at Mobil's Stony Brook Nuclear Laboratory is used to irradiate test specimens . . . help Mobil study effects of radiation on petroleum materials and find improved refining techniques.

Top-left: 360,000-kw Station being built at Hunterston, England. *Right:* 561,000-kw Atomic Power Station under construction at Hinkley Pt., England. *Below:* Dresden Nuclear Power Station in Illinois, now America's largest. All rely on Mobil.

Mobil Nuclear Lubrication

Through research, Mobil has determined the radiation limits of its present power plant lubricants, and is developing high threshold products for use where radiation exceeds these limits. These evaluations show Mobil DTE oils meet every requirement of today's Nuclear-Powered turbines. And certain Mobil extreme-pressure greases can withstand 200-million rads. In addition to these present-day lubricants Mobil has developed experimental products that resist doses of up to a billion rads, including a control-rod actuator grease approved by the United Kingdom Atomic Energy Authority. Mobil is also evaluating a method of determining condition of oil in use by adding a radiation-sensitive tracer that accurately shows when radiation limits are reached. These are some of the ways Mobil is preparing today for tomorrow's nuclear power needs.

Mobil Protected Nuclear Power Plants

For years Mobil has been a world leader in the lubrication of conventionally powered turbines. Now in the Nuclear Age Mobil leadership continues. By early 1961 more than 60% of America's nuclear power output will be generated with the help of Mobil lubricants. America's largest atomic plant—the 180,000-kw Dresden Nuclear Power Station—protects its turbine with Mobil DTE oil. And even larger plants abroad will be Mobil protected. The 360,000-kw Hunterston plant and the 561,000-kw Hinkley Pt. plant under construction in England will both rely on Mobil. Mobil research and know-how are behind Mobil's continuing leadership in the Nuclear Age.

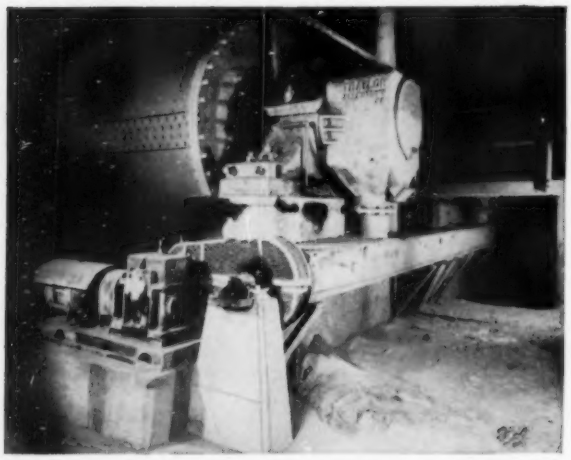
Hinkley Pt. Power Station—Built by English Electric Co., Ltd., Babcock and Wilcox Ltd., Taylor Woodrow Atomic Power Group for Central Electric Generating Board. **Hunterston Nuclear Power Station:** Builders—General Electric Company Limited of England for the South of Scotland Electricity Board. **Dresden Nuclear Power Station**—Built by General Electric Company for Commonwealth Edison Company and the Nuclear Power Group.

America's leading protector of Nuclear-Powered Turbines!

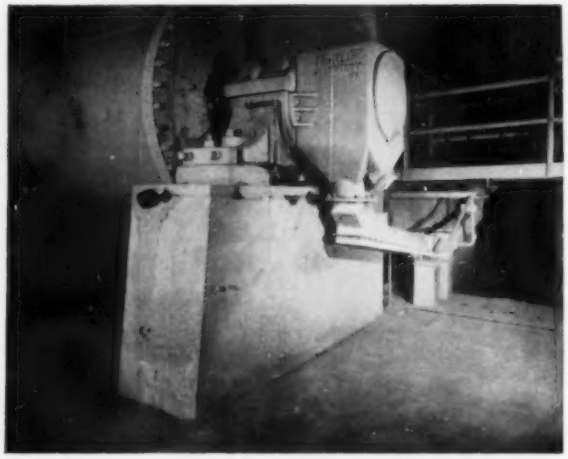
MOBIL OIL COMPANY, 150 East 42nd Street, New York 17, N. Y.

Mobil

The Arithmetic of Materials Handling



BEFORE: **Dirt, noise and mechanical breakdown** were constant problems in this cement plant, where two mechanical conveyors were used to collect raw materials. A 5 h.p. motor driving auxiliary equipment wasted valuable space and power, required frequent maintenance. Spillage clean-up wasted costly man-hours.



AFTER: **Clean, simple, quiet.** Notice the difference two 8" F-H Airslide® fluidizing conveyors have made. No dangerous moving parts. Nothing to lubricate. Auxiliary equipment and foundations are gone. Power needs are now only ⅓ of previous needs. Fluidizing saves wear and maintenance.

AIRSLIDE® Fluidizing Conveyor

minimizes material loss . . . maintenance . . . moving parts

If you are now handling dry, pulverized materials, the F-H Airslide Fluidizing Conveyor can help you stop noise, and air-pollution, as well as speed flow and reduce maintenance cost.

Simplicity Itself

F-H Airslide conveyors fluidize dry, pulverized materials with low pressure air.

These materials literally flow at high speed, down the inclined conveyor. Power requirements are small.

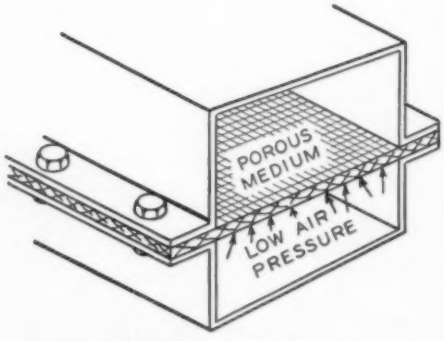
Flexibility, Low Cost

For unlimited applications, Airslide conveyors take up little space, and can be used singly and in combination with other Fuller pneumatic conveying systems. The movement of fluidized material can be around corners, between floors, through walls—nearly any conveying distance.

Better Housekeeping

Can Fuller conveying systems help eliminate your housekeeping problems—cut your maintenance and handling costs? Write today, outlining your problem in handling dry, finely-divided materials. Fuller will gladly make appropriate recommendations.

"Pulverized Materials Flow Like Water!"



FLUIDIZING PRINCIPLE: Porous supporting medium divides conveyor section into two "compartments". Dry material flows down inclined conveyor, fluidized by low-pressure air entering beneath porous medium.

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STEEL EQUIPMENT

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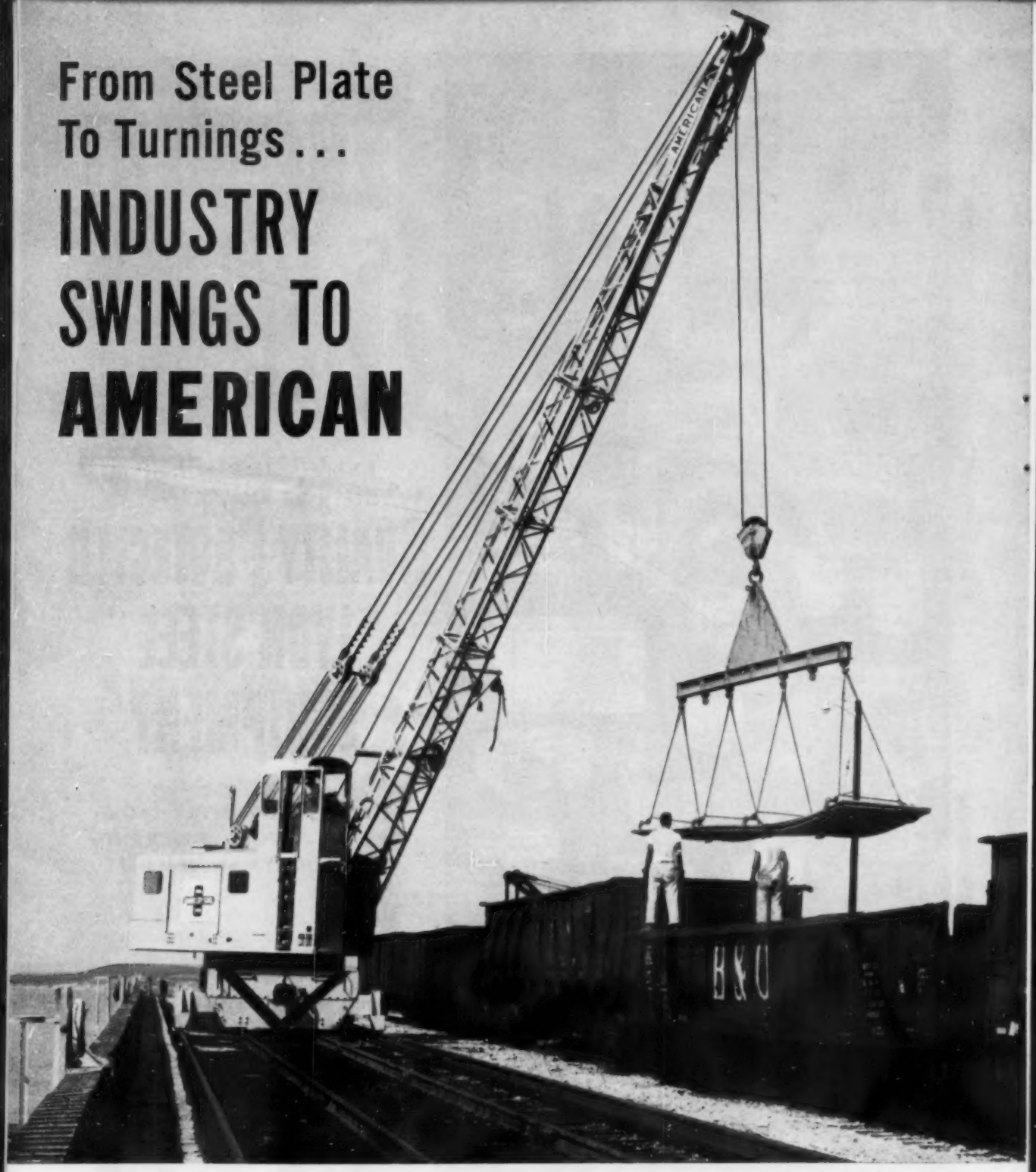
From Steel Plate To Turnings...

INDUSTRY SWINGS TO AMERICAN



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EXCAVATORS-CRANES to 4½ yds.-110 tons
LOCOMOTIVE CRANES to 130 tons

DERRICKS-HOISTS to 800 tons
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Forged fittings for wire rope-chain

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AMERICANS IN ACTION

American Locomotive cranes, both Diesel and DiesELectric,® are better engineered, better equipped to move materials faster, more efficiently, with greater dependability. Built for 24-hour, day after day performance, Americans give you trouble-free service on every job.

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OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

System Solves Scrap Problem

GETTING scrap paper or board away from production areas and baled quickly is a must in plants where mountains of scrap are generated and must be disposed of continuously. This problem has been solved in the Chicago plant of the Owens-Illinois Paper Products Division where a modern automatic scrap board handling and baling system has been installed.

Furnished by the East Chicago Machine Tool Corporation through its Balemaster Division, the scrap system provides automatic operation in every portion of the plant. Pickup stations at the corrugator, slitter-scorer and the printer slotters remove the trim and waste strips by suction and blow it through a system of air-conveying ducts to the separator located on the roof directly over the automatic baler.

Flow of scrap to the baler is entirely automatic and is controlled by electric eye devices. Only one man is required to operate the entire baling and material handling operation. The baler compresses the scrap board into bales weighing nearly 1000 lb for shipment to paper mills for processing.

Pickup ducts and overhead blowers are suspended from the roof trusses and occupy a minimum of floor space. The main ducts are located on the roof and feed directly into the separator.

TV Helps Precision Inspection

CLOSED CIRCUIT television is being used by the Quality Control Department of Convair-San Diego Division of General Dyamics Corp., in a new inspection method designed to greatly reduce the time required for making a complete dimensional check of aircraft parts. Under previous methods large machined sections were fixed to a surface plate and measured with a height gage. To make a second measurement along another axis required a complete new setup of the piece, a procedure sometimes involving several hours of the quality control engineer's time.

To lick this problem Convair engineers designed a universal inspection machine built around a closed circuit television system manufactured by the Kin Tel Division of Cohu Electronics Co. The machine has a frame of welded pipe, is rectangular in shape and measures about six feet by eight feet by three and one-half feet high. The interior is open so that large aircraft or missile sections to be inspected can be placed inside on a two-foot high table.

Closed circuit TV system used on measuring jig reduces inspection time.

Across the top of the rectangular frame is a carriage that can be moved from one end of the frame to the other. This carriage holds the television camera on a bracket that can be moved back and forth across the carriage by means of a rack and pinion arrangement. The camera, facing downwards, can then be moved to any position over the inspection table. The distance it travels in either direction is easily determined by two vernier scales, both accurate to 0.001 in.

The camera lens, focused by remote control, is a telephoto type that enlarges the field of view about 30 times and is equipped with a cross hair to assist in precise positioning. A 14-in. television monitor is placed near the inspection table to show the operator the exact position of the camera over the part to be inspected.

To make a measurement, the

(Continued on page 66)

Used Utility Truck Makes Low-Cost Maintenance Rig

To solve the problem of transporting men and materials to jobs scattered over a wide area, Ken Biddle, Plant Engineer, Sundstrand Aviation, Rockford, Illinois, bought this used truck from a nearby utility for $400. It came equipped with a power winch and a hoist rig. Tools, ladders and a 110-v generator were added and the truck is now used to service areas located some distance from the plant.

5 Reasons why it pays to buy from Ryerson

MOST DIVERSIFIED STOCKS—Ryerson inventories include by far the widest range of types, shapes and sizes available anywhere.

FAST SERVICE—A combination of varied stocks, modern equipment and an experienced staff means stepped-up processing for *regular requirements* and unparalleled ability to meet the most urgent *emergency needs.*

HIGHEST QUALITY—New quality-control standards, completely detailed and published, govern every aspect of Ryerson specifications and operations. Here is steel that's *certified* for dependable performance, and cut to your most *exacting* requirements.

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LET RYERSON CARRY YOUR INVENTORY—Whatever your maintenance steel needs, you get one-call, one-order delivery at Ryerson. Order today.

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For more facts circle 541 on Reply Card

OPERATION — PRODUCTION

(O and P begins on page 64)

operator locates the cross hair on one edge of the test section by sighting it with the TV monitor, records the vernier reading and then moves the carriage assembly to the other side of the part. He makes a second reading and subtracts the two figures to obtain the true dimension. Because the camera can move in both axes, he is able to repeat the procedure in the other direction. He then has a complete dimensional check without ever having to alter the position of the test part.

Reduction in setup and inspection time using the television system has been significant.

Sludge Removed From Salt Bath Without Losing Production Time

SIDE-ZONE sludge removal, engineered into salt bath cleaning equipment, has made it possible to maintain continuous cleaning, descaling or paint stripping operations with no shutdown time for salt pot cleaning. This feature, which has been built into numerous units in a wide range of capacities, can also be added to existing equipment, according to engineers of Kolene Corporation.

Success of the system is due to the controlled direction and rate of flow of the entire salt charge through the four inter-connected zones of the bath. These are illustrated as A, the agitator zone, generated by a motor-driven propeller; B, the work zone; C, the sludge settling zone, and D, the heating zone.

Direction and flow of the bath is engineered to specific applications. Sludge is deposited into a small pan, located in the settling zone and is easily removed with no loss of production time.

Salt loss during de-sludging is reduced to a minimum. In stainless steel and alloy pickling operations, there is no contamination of the molten bath by carbonates or insolubles. No sludge settles on or near the burner tubes resulting in longer tube life. Uniform heat transfer and maximum heating efficiency is maintained throughout the entire bath.

Sludge is removed from settling zone C, without losing production time.

Pressure Filter Cuts Inventory 50 Per Cent, Saves Plant Space

CONVERTING to a pressure feed filtering system at the Chesebrough-Pond's Inc., Perth Amboy, N. J., plant has resulted in a 50 per cent reduction in filter inventory as well as substantial savings in labor costs and plant space. Pumps, piping and valves play an important part in maintaining the efficiency of the new pressure filter system.

Pumps recirculate filtered product continuously to remove color from the jelly.

Petroleum or petroleum jelly is a distillate residue of the petroleum refining process and has a dark color in its raw state. A bauxite filter efficiently removes this color but to obtain standard white and yellow end products requires continuous recirculation and mixing of various stages of the filtered product.

At temperatures above the melting point, 110 to 114 F, petroleum shows a marked increase in the tendency to leak through even the tightest pipe joint or thread. To counter this tendency, C. S. Pennington, chief engineer of the Perth Amboy plant has installed sliding disc-type valves manufactured by Everlasting Valve Company. During five years in this service these valves had not leaked and had required no maintenance. All valves in the process are manually operated.

Vacuum System Speeds Cleanup

PORTABLE vacuum equipment is used at the Ohio Products Company, subsidiary of The Ohio Injector Company, Orrville, Ohio, to pick up mold sand spillage in one-quarter the time and at one-sixth the cost of previous methods.

After castings have been made, the mold sand is dumped from the flasks through a grating and onto a vibrating pan conveyor in a covered trench. The conveyor carries the sand back to the blenders.

No matter how carefully the flasks are emptied, some of the sand spills over the sides of the conveyor and collects underneath the pan and at the side of the trench. If the sand is allowed to build up it can stop the conveyor and interfere with production.

Formerly, workers standing on the conveyor used small shovels to scoop out the sand. Because of the time required and the fact that the line had to be shut down, the work was done on weekends. Cleaning up along the entire length of the conveyor required 16 man-hours per week at time-and-one-half pay or the equivalent of 24 hours at straight time.

Now, one man with the vacuum equipment does the same job in four hours during the night shift. This represents a savings of 12

With conveyor shut-down, worker uses vacuum system to remove spilled sand.

actual work hours or 20 hours in wages. Because of these time savings, Ohio Products engineers estimate that the vacuum equipment, furnished by Invincible Vacuum Cleaner Mfg., Co., Dover, Ohio, will pay for itself in less than one year.

High-Speed Splicing Saves Time

A NEW high-speed, off-machine coater, producing high-quality magazine paper with minimum scrap loss, is now in operation at the Blandin Paper Company, Grand Rapids, Minn. Able to splice at rates exceeding 2000 fpm, the coater has accounted for a 225 per cent increase in Blandin's coated paper production.

Key to the high-speed splicing is a General Electric drive system which powers and automatically controls the unwind and six other sections of the machine. A high degree of automatic control is attained by the incorporation of individual drive systems, including separate generators and d-c motors in each section.

As the paper is coated and dried, it tends to alternately stretch and shrink. The drive compensates with the proper speeds and tensions that will maintain a consistent product. Throughout the process a General Electric tensiometer automatically transmits electrical signals that hold tension at pre-set levels.

As the important splice interval nears, the operator pushes a button that triggers the splice sequence. A photoelectric impulse from the core

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Dept. 760, Skokie 23, Illinois

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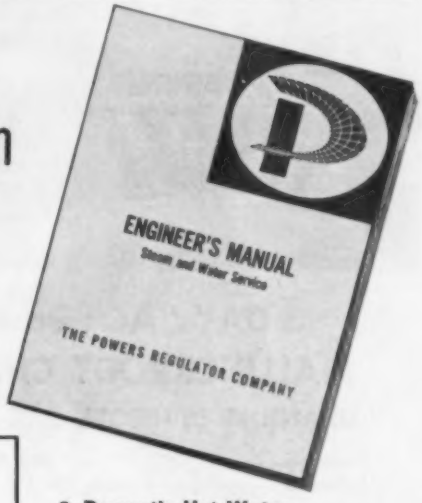

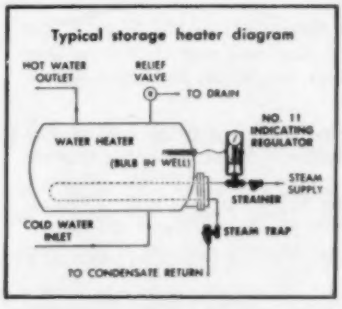

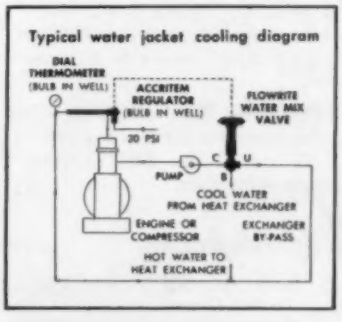

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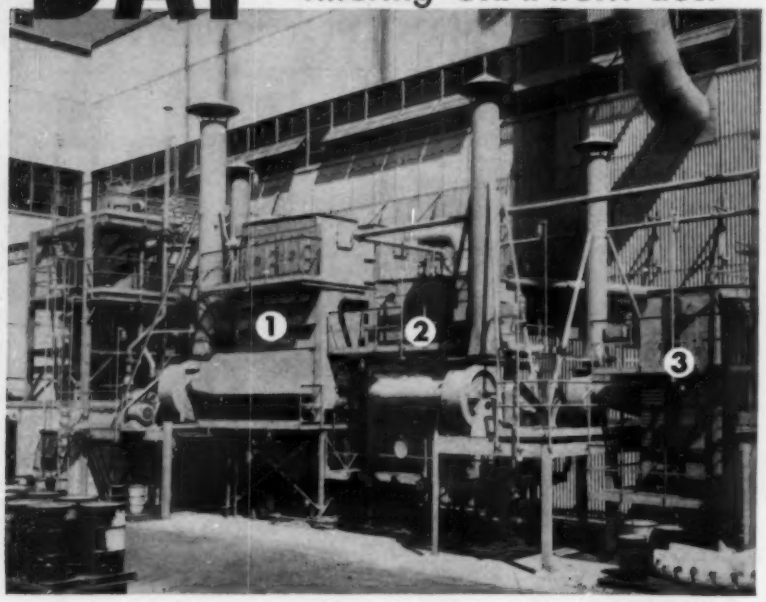
DAY *plant proven dust control filtering URANIUM dust*



3 DAY "AC" Dust Filters Serve MALLINCKRODT CHEMICAL WORKS

URANIUM DIVISION, AEC Weldon Springs Site

Shown above are 3 DAY "AC" dust filters. Filters No. 1 and 2 are collecting magnesium fluoride (M_gF_2) slag dust and U_3O_8 from slag grinding and similar operations. Filter No. 3, on the right, serves to filter uranium tetrafluoride (UF_4).

Equipment with high filtering efficiency is an imperative requirement for an installation of this type. These DAY filters meet this requirement. They capture sub-micron particles with 99.99+% efficiency because they are designed around the Hersey principle of air filtration which uses felted filter media. Filter media porosity is maintained automatically and continuously by high velocity reverse jet air. This assures stable back pressure.

Throughout many industries DAY equipment is preferred because it's *plant proven*. It means DAY not only offers high efficiency and pure, clean air but higher recovery of valuable product. DAY "AC" reverse jet filters are also preferred because they occupy a minimum of space and provide higher air handling capacities (4 to 5 times higher than non-reverse-jet type filters).

For more facts about the services and equipment DAY offers, consult your DAY application engineer, and for complete facts about DAY filters write toDAY for Bulletins F-75 and G-579. They contain helpful planning information and air engineering data.

The **DAY** *Company*

SOLD in UNITED STATES by
The DAY SALES Company
807 Third Avenue N.E.
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Dust Control • Pneumatic Conveying • Bulk Storage
EQUIPMENT SYSTEMS INSTALLATION

For more facts circle 543 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

Splices are automatically made at 2000 fpm by operator pushing splice button.

of the new roll automatically signals the paster to secure the splice. A guillotine then severs the empty roll, leaving only inches of scrap.

Argon Protects Pipe Weld

EXPANSION of Cleveland Electric Illuminating Company's Avon Lake, Ohio, power plant, necessitated 154 welds in stainless-steel steam and reheat piping. To provide inert-gas shielding within the pipe, two air balloons were inflated, one on either side of the joint.

Argon gas was then pumped in to displace the air and protect the weld from contamination. The balloons inflated tightly against the pipe

Two inflated balloons inside pipe restrict inert argon gas to weld area.

CHECK the features of the...

Series 701 Screw End Check Valve Illustrated
Series SW701 Socket Weld End Valve also available

FORGED STEEL BOLTED BONNET

CHECK VALVES

150-800 POUNDS @ 850°F
2000 POUNDS COLD WORKING PRESSURE W.O.G.

1. These valves have Stellite* hard faced integral seats
2. 13% Chrome stainless piston checks
3. Stainless steel asbestos spiral wound body-bonnet gaskets
4. Forged steel bodies designed for light weight with maximum strength
5. Available in ¼" thru 2" sizes in both screw and socket weld ends

Write for Catalog F-10 to Dept. 24A-FPLE

HENRY VOGT MACHINE CO., BOX 1918, LOUISVILLE 1, KY.
SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J.
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Vogt

GENERAL GP PURPOSE

FORGED STEEL VALVES

*Product of Union Carbide Corp.

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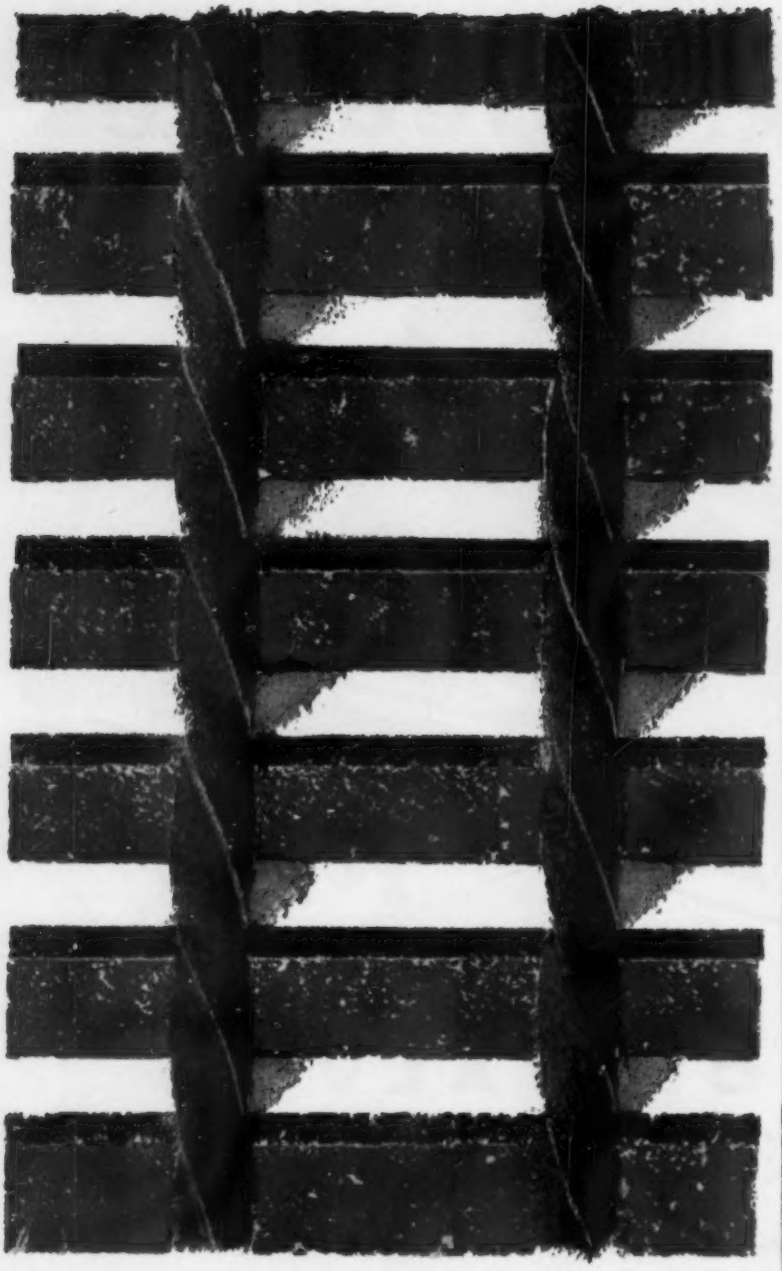


Blaw-Knox Electroforged Grating solves so many problems for so many industries. Catalog free on request. Write Blaw-Knox Equipment Division, Pittsburgh 38, Pennsylvania.

BLAW-KNOX
GRATING

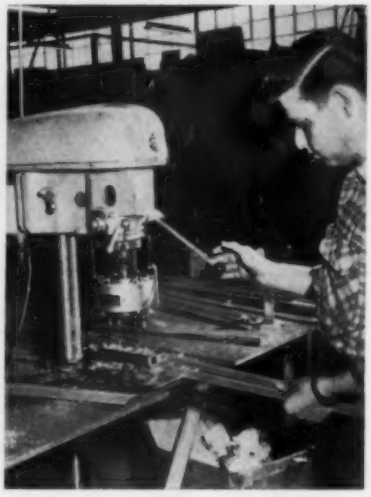
For more facts circle 545 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 64)

inner wall, blocking gas flow and keeping argon cost to a minimum. A consumable insert ring was then Heliarc welded between the abutting pipe sections to provide a tight joint. The Heliarc equipment was furnished by Linde Company, a division of Union Carbide Corporation.

Double Fixture Doubles Output



Four holes are drilled simultaneously in two parts used to make storm windows at Capital Products Company, Mechanicsburg, Pa., using a standard Delta 14-in. drill press equipped with double fixture and multiple drill head.

Vibration Tester Finds Defects

NORMAL VIBRATIONS encountered in most commercial vehicles can pose a major problem in the shipment of delicate equipment. These vibrations have a deteriorating effect on most packaging materials thus exposing the product to damage. A loose or intermittent electrical connection caused by vibration can render electronic equipment completely useless, resulting in costly maintenance, delays and poor customer relations.

For this reason, the Ampex Data Products Company of Redwood City, California, subjects its magnetic tape recording equipment to numerous environmental tests to insure operational reliability under all conditions. To conduct its vibration test, Ampex uses a

WONDERING HOW TO CUT PAINT MAINTENANCE COSTS?

If you want to cut maintenance costs, Herb Norton's a good man to talk to. A member of Du Pont's recently formed Technical Service Group, Herb's a specialist whose job it is to solve maintenance painting problems of every description. In his words:

"The further maintenance dollars go, the greater the return on your investment in plant and equipment. True costs, however, aren't determined solely by the price of the paint. To measure value accurately, you've got to take into account such factors as expense of application and length of time the paint job lasts. Believe me, it's false economy to start with anything but top-quality finishes. That's one reason Du Pont paints are so often specified.

"Another reason, equally important, is the expert guidance you get from Du Pont. You see, we go right into your plant or installation and make a thorough study of your individual maintenance problem. Then—drawing on our own experience, backed up by Du Pont technical competence—we formulate a painting program that meets your needs exactly. Service like this helps you achieve lasting protection against every conceivable corrosive condition, *at lowest cost per square foot per year.*"

If you have a maintenance problem you'd like to discuss with an expert, there's a man like Herb Norton in *your* area. To meet him, just call your nearest Du Pont district sales office. Or write: E. I. du Pont de Nemours & Co. (Inc.), Finishes Division, Dept. PE-67, Wilmington 98, Delaware.

* * *

Herbert L. Norton came to Du Pont's Finishes Division in 1939, having studied chemical engineering at the Georgia School of Technology. As he added experience, increased responsibilities kept pace. Currently, Herb is Southeastern District Manager, Industrial Maintenance Sales. His background includes problem-solving in such areas of industry as textile, paper, petroleum, food, marine and public utilities.

DU PONT PAINTS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

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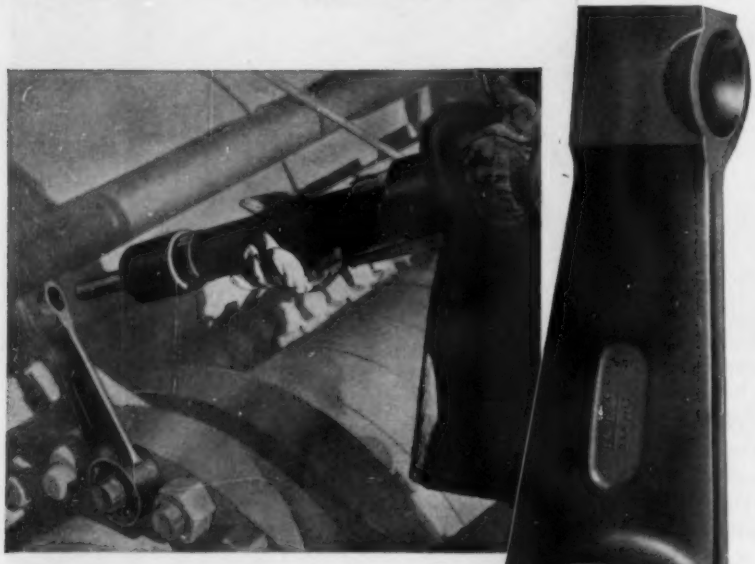
You find Gates Hose where anything flows.

SOCK that wrench without dangerous arm swing



Snap-on® CUPPED-ANVIL BOXOCKETS®

These big, tough, cupped-anvil wrenches make teardown and reassembly faster, safer, easier. They've proved invaluable at refineries, processing plants, power plants — any place where large bolts and nuts are turned by sledging.

The wrench is turned by means of an air-powered impact tool with a bull nose adaptor which is inserted into the wrench's cupped-anvil head. No more sledge swing on high catwalks or scaffolds. With this wrench, a man can hold still and let the air tool do the work. Wrench can also be driven with a sledge hammer, if desired. Twenty-seven wrench openings from 1-7/16″ to 4-5/8″; over-all wrench lengths from 7-5/8″ to 20″.

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SNAP-ON also makes a full range of regular sledge wrenches. Twenty-seven wrench openings from 1-1/2″ to 4-5/8″ with over-all wrench lengths from 7-5/8″ to 19-31/32″. Sockets are available for both the cupped-anvil and regular sledge BOXOCKETS. The sockets have hex driver heads which are inserted into the BOXOCKET openings. Thirteen wrench sizes — 1-5/8″ to 4-5/8″.

Put new safety into your big nut- and bolt-turning jobs. Order cupped-anvil wrenches from your SNAP-ON representative now. Branch offices and warehouses in industrial centers throughout the country. Write us for industrial calalog.

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OPERATION—PRODUCTION

(O and P begins on page 64)

Transportation vibration simulator tests package protection before shipment.

heavy duty transportation vibration simulator machine.

Manufactured by the L. A. B. Corporation of Skaneateles, New York, the simulator has a capacity of 1000 lb. and consists of a wooden platform supported by two shafts located near each end of the table. Each of the shafts carries two eccentrics which have a throw of one inch. By simple adjustment, the speed or number of cycles per minute can be varied.

Lighting Conceals Services

Visitors to the home office building of the Berkshire Life Insurance Company, Pittsfield, Mass., are impressed with the quality of the lighting environment and the architectural precision of the Smithcraft Lighting installation. Although not apparent, system also incorporates all acoustical correction and provides room for and easy access to air conditioning, heating, public address system.

You find Gates Hose where anything flows. Fremont Canyon Tunnel, $14,500,000 project near Casper, Wyoming where more than 22,000 feet of Gates Air Drill and Water Hose have been used. Workmen here are drilling prior to blasting excavation for substructure of powerhouse. Air hose is Gates 18MB Wire Braid Air Drill Hose.

Gates Air Hose delivers on the job "that couldn't be done!"

Industry everywhere uses impressive amounts of air, water, steam, suction and many other hoses in the full range of types and sizes made by Gates.

Back of the world-wide acceptance of Gates Hose is a continuing program of *specialized* hose research at the multi-million dollar Gates Research Center, staffed by more than 200 chemists, physicists and engineers.

It is the aim of this *specialized* research to increase hose utility and life . . . lower Industry's annual hose cost.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers in the United States and in 90 countries throughout the world . . . and its outstanding performance is guaranteed by the *World's Largest Maker of V-Belts.*

Gates 18MB Wire Braid Air Drill Hose, with oil resistant tube and abrasion resistant cover, gives exceptional performance on all heavy duty air usage under the most severe working conditions. This popular hose — one of many in Gates full line — is always available from your nearby Gates Distributor.

The Mark of *Specialized* Research

The Gates Rubber Company • Denver, Colorado

Gates Rubber of Canada Ltd., Brantford, Ontario

Gates Industrial Hose

Made in a Full Range of Types and Sizes

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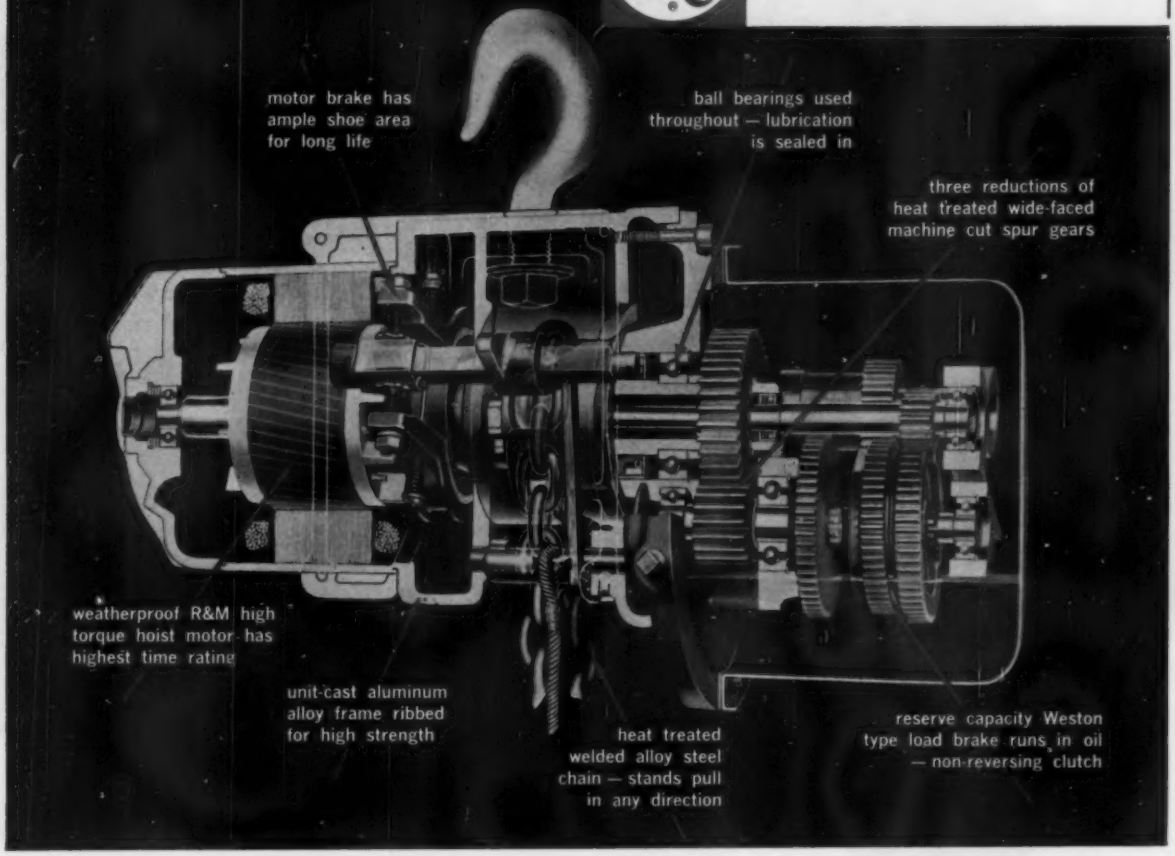
R&M

HOISTS/CRANES


motor brake has ample shoe area for long life
ball bearings used throughout — lubrication is sealed in
three reductions of heat treated wide-faced machine cut spur gears
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unit-cast aluminum alloy frame ribbed for high strength
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HOIST RUGGEDNESS AT ITS BEST

Robbins & Myers Type JC chain hoists are the kind you need for heavy service over bruising loads. At prices fully competitive, they incorporate extra-husky features that withstand continual punishment. Here are some of the points of superiority that can go to work for you: R&M high-torque hoist motor has the highest time rating found in any hoist—30 min., 55° C. Weatherproof construction locks out moisture. Two brakes guard the load—a Weston type load brake has reserve capacity and a shoe type motor brake lets you spot loads cleanly and accurately. Sealed, weatherproof controls operate by rope. Type JC hoists are stocked near you for immediate delivery. Features and options: portable, 10 foot lift, hook mounting or push trolley, capacities – 500, 1000, and 2000 lbs. Request Bulletin 852-B from the Hoist & Crane Division, Robbins & Myers, Inc., Springfield, Ohio or Brantford, Ontario.

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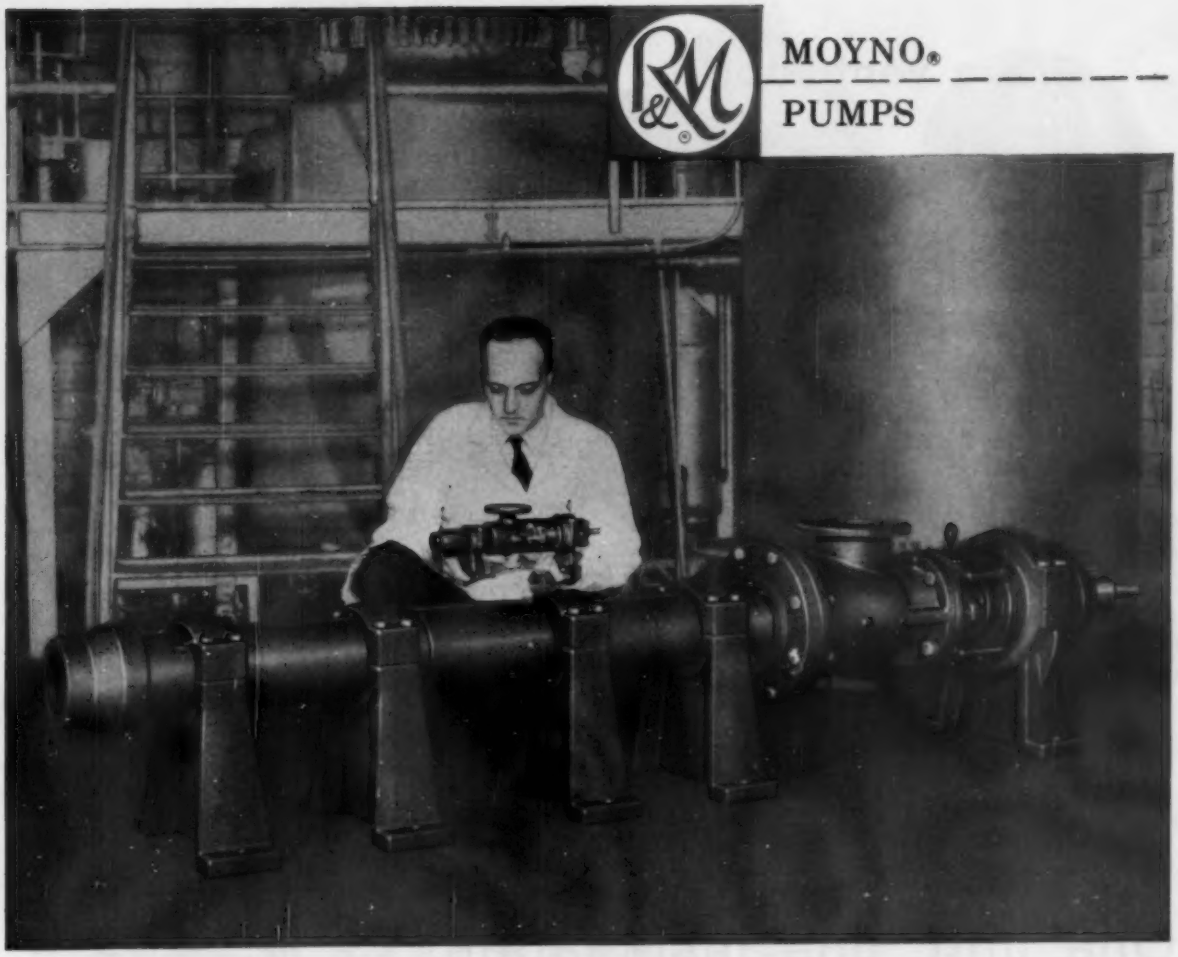


MOYNO®
PUMPS

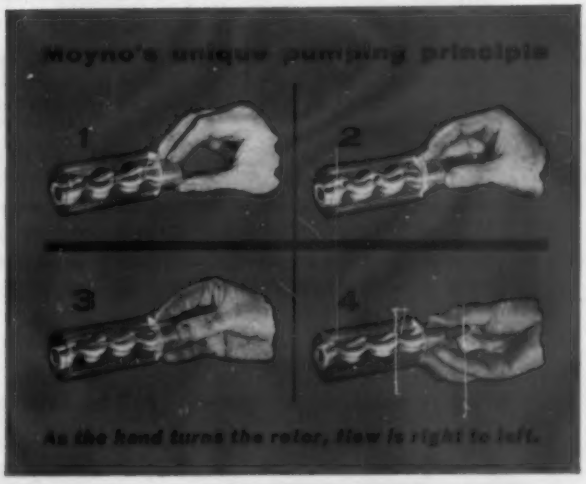
MOYNO® PUMPS

capacities: from 1/100 to 500 gpm
pressures: up to 1000 psi

MOYNO pumps are available in nine sizes with capacities ranging from minimum metering flow to 500 gpm and pressures from zero to 1000 psi. Positive displacement delivers uniform discharge without pulsation, agitation or turbulence. Solutions ranging from thin watery slurry to extremely viscous paste, corrosives, abrasives and even solids in suspension are economically handled without excessive pump wear.

MOYNO's unique *"progressing cavity"* principle with only one moving part and special resistant internal parts slashes pump maintenance costs on problem materials that often ruin other pumps. Almost any substance that can be forced through a pipe can be pumped by a MOYNO.

To learn how a MOYNO can cut your pumping costs, write today for Bulletin 30-PE



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motors, household fans, Propellair industrial fans, hoists, Moyno industrial pumps

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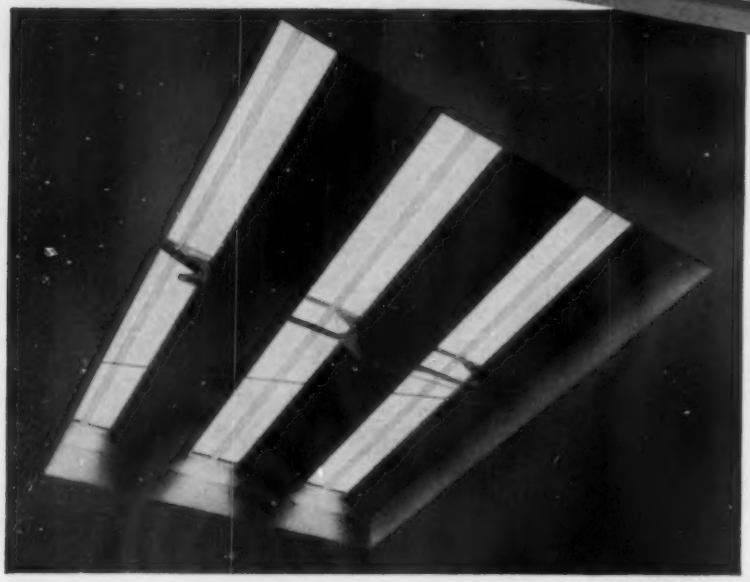
It's a ventilator . . .

It's a skylight . . .



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by

Swartwout

Patent No. 2,784,660

One unit, one installation, one cost!

- Strong, translucent Fiberglas* dampers and gutters transmit soft, diffused light . . . no glare or hot spots . . . up to 12,380 candlepower with dampers closed, 16,450 with dampers open.
- High capacity gravity ventilator moves air silently and efficiently. Low 21" roof silhouette is inconspicuous from the street. 30 square feet of free opening provided by each standard unit.
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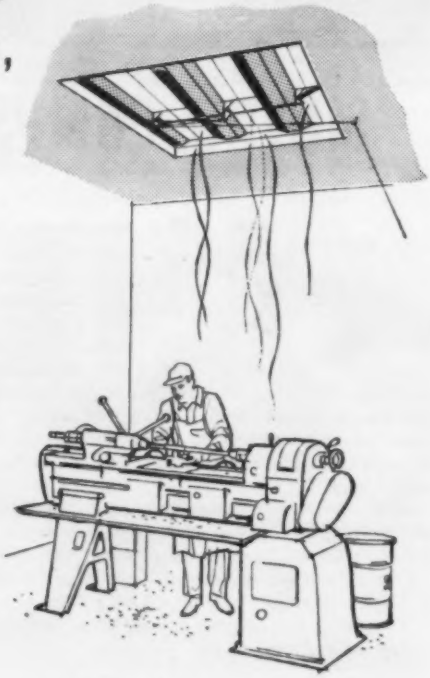
- Unique Lite-'n-Aire provides ventilation, skylighting and fire relief all in a single, economical unit. Two sizes — 7'6" x 10' and 5' x 5' — fit any situation.

These and many other advantages are all available **now** in the new Swartwout Lite-'n-Aire.

Write for free 8-page folder now. Ask for bulletin CAM-3.

* TM Owens-Corning Fiberglas Corporation



Swartwout

SWARTWOUT Fabricators, Inc.

Kokomo, Indiana

In Canada: Eastern Steel Products Ltd., 8 Bermondsey Road, Toronto, Ontario

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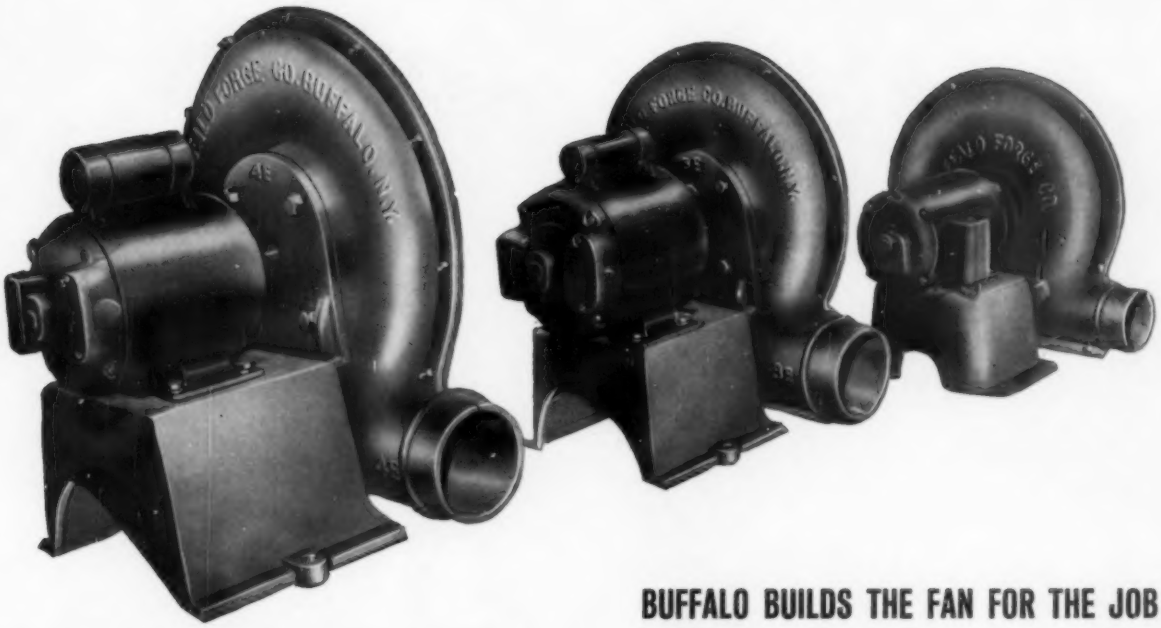

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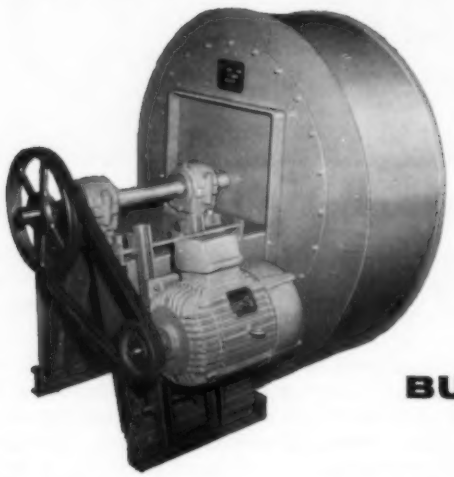
BLOWING • EXHAUSTING

FOR PRESSURIZED AIR APPLICATIONS Buffalo Type "E" Blowers are compact, husky units in 5 sizes up to 5500 cfm, for constant pressures up to 2 lbs., on direct-connected applications such as:

- Oil or gas furnace blowing
- Cupola blowing
- Gas line boosting
- Exhausting from grinding wheels
- A quality unit to put on equipment you sell.

A number of these efficient motor-driven units can provide power and installation savings over one large blower — plus flexibility of operation. For full details, write for Bulletin FM-900.



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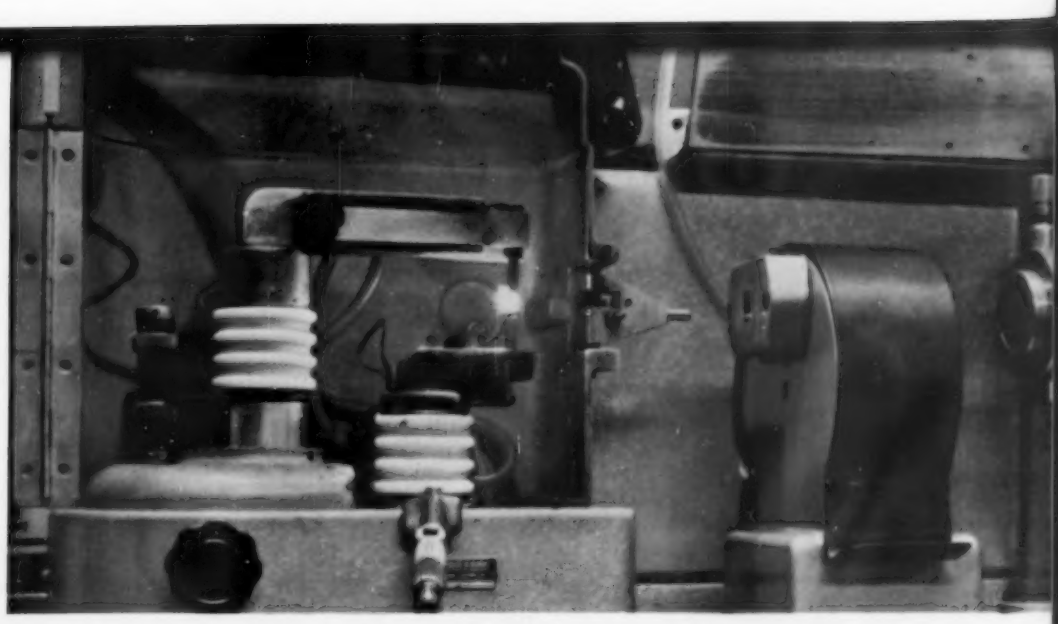

Emission Spectrograph (above) causes undesirable elements in a petroleum sample to emit their characteristic light spectrum which is photographed on a strip of film. In the Densitometer (below) the spectrum on the film is evaluated to identify the presence of metal contaminants down to less than one part per million.

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This is a Butler building—all 222,000 square feet of it. It belongs to Flick-Reedy Corp., Chicago, whose Miller Fluid Power division manufactures air and hydraulic cylinders. Frank Flick, president, says the working conditions in this building promote employee comfort, safety and convenience. This spells high morale, a key factor in quality production.

Flat roof structures have no such natural accommodation for fixtures, which swoop low overhead, or occupy important floor space. Butler industrial buildings, such as Flick-Reedy's, have the muscle to support heavy cranes and hoists. No need to resort to obtrusive floor cranes, or shore up overhead craneways with bulky, costly reinforcements.

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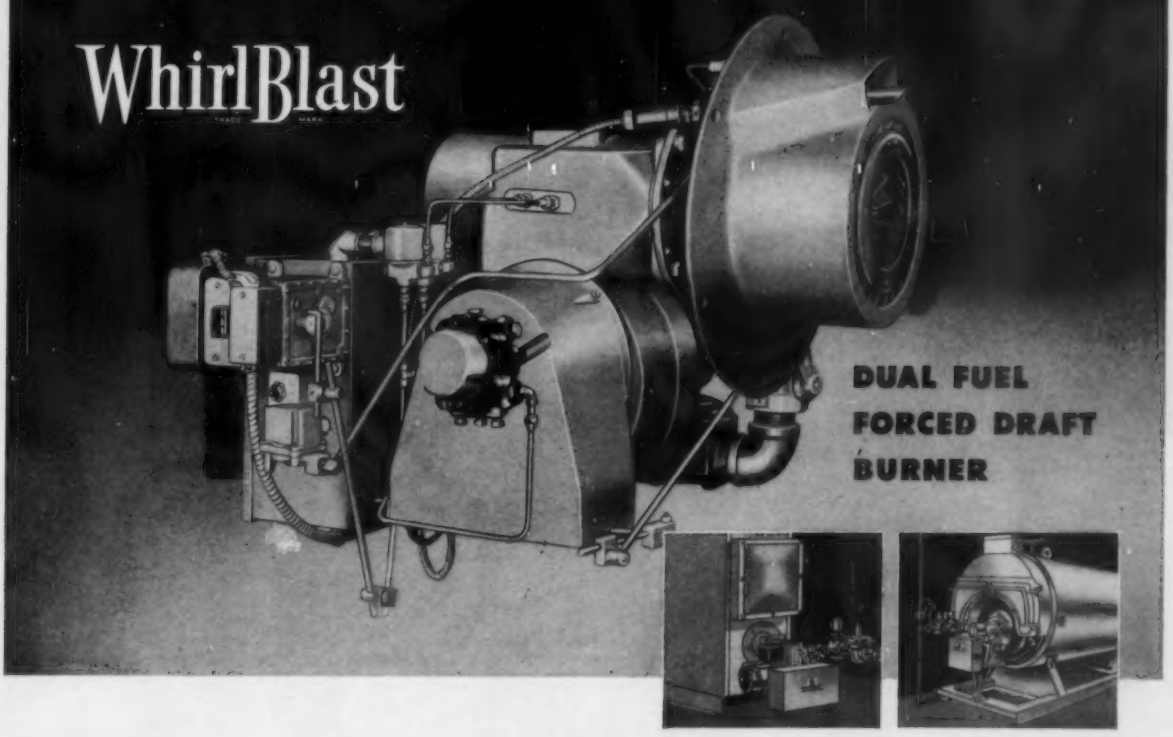
A new development by Iron Fireman

WhirlBlast



Makes firebox boilers super-efficient

NO SMOKE

Burns clean in less than 10 seconds. The WhirlBlast flame is brilliantly clean almost instantly, and stays clean. Although accepted standards of oil firing allow a 15 minute warm-up period, during which time smoke is tolerated, the Iron Fireman WhirlBlast burner is clean in seconds. Smoke and soot are unburned fuel—completely wasted by smoky starts.

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Needs only an exhaust vent. Boilers with conventional burners require from 30 to 80 feet of stack or an induced draft fan. Sealed steel firebox boilers with WhirlBlast burners require only a small exhaust vent.

CONSERVES BOILER HEAT

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No special skill to install, adjust, service or operate. The WhirlBlast burner (for gas, oil or dual-fuel combination) comes from the factory fully wired and tested. Bolts to boiler front with firing head through fire door. No special combustion chamber or firing pit needed. Exceptional installation saving.

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Please send me more information and specifications on the Iron Fireman WhirlBlast burner.

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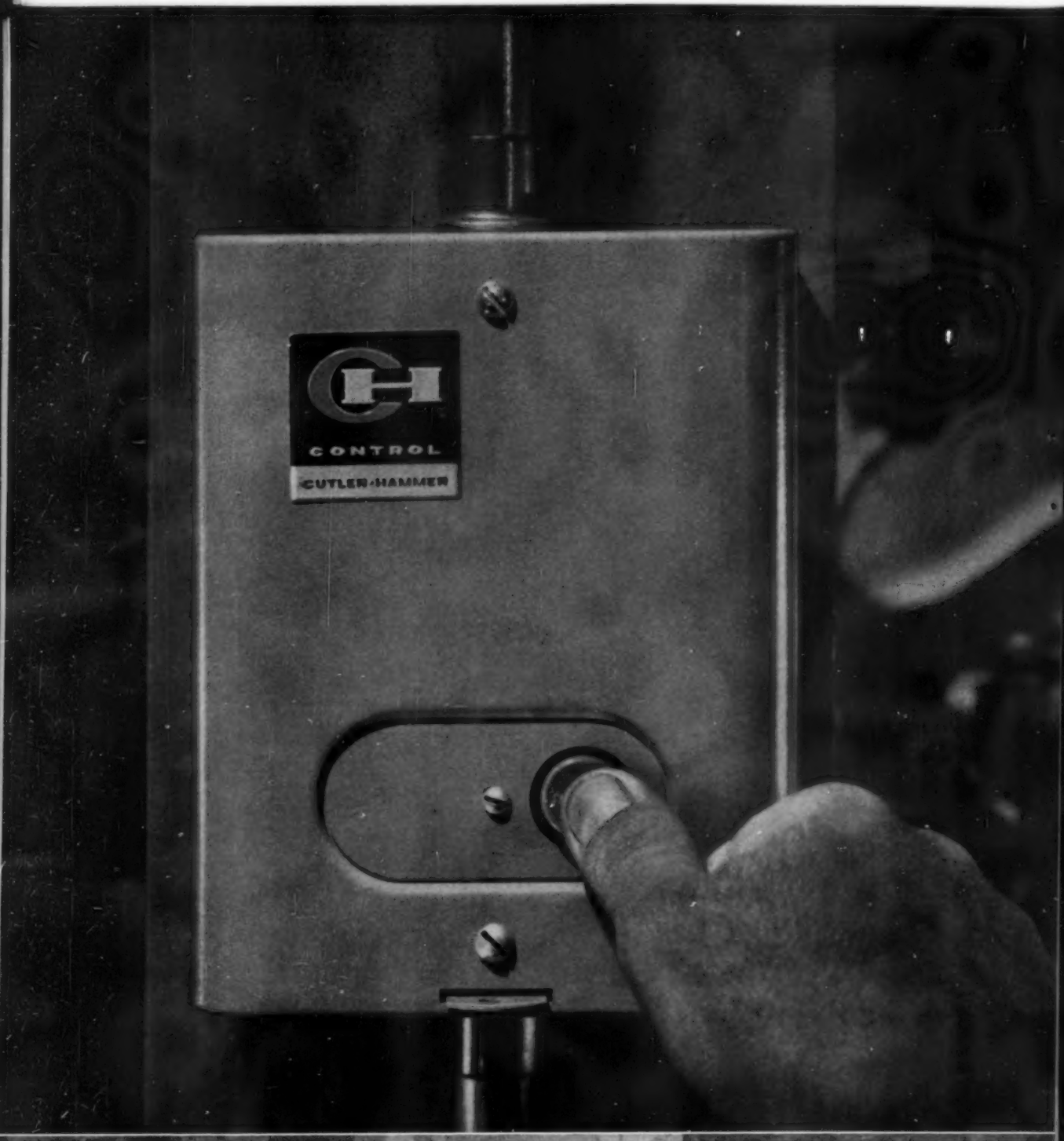

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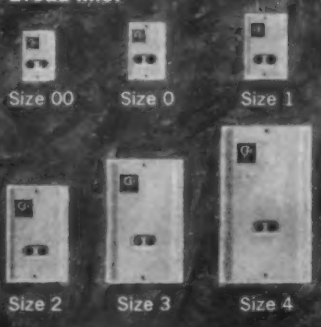

A new addition to the famous three star line

New! Save space and money with Cutler-Hammer's Size 00 A-C Magnetic Starter

Takes up to 20% less space... costs 18% less than Size 0 Starters. Now you get two big new bonuses in control selection . . . less space and less money Both with the all new Size 00 Starter.

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The new Cutler-Hammer Size 00 Starter performs to the same high standards you get from all Cutler-Hammer Starters. And, you still get vertical, dust-free contacts which add so much to more reliable starter performance. Your choice too, of 2-coil or 3-coil overload protection in the same small enclosure.

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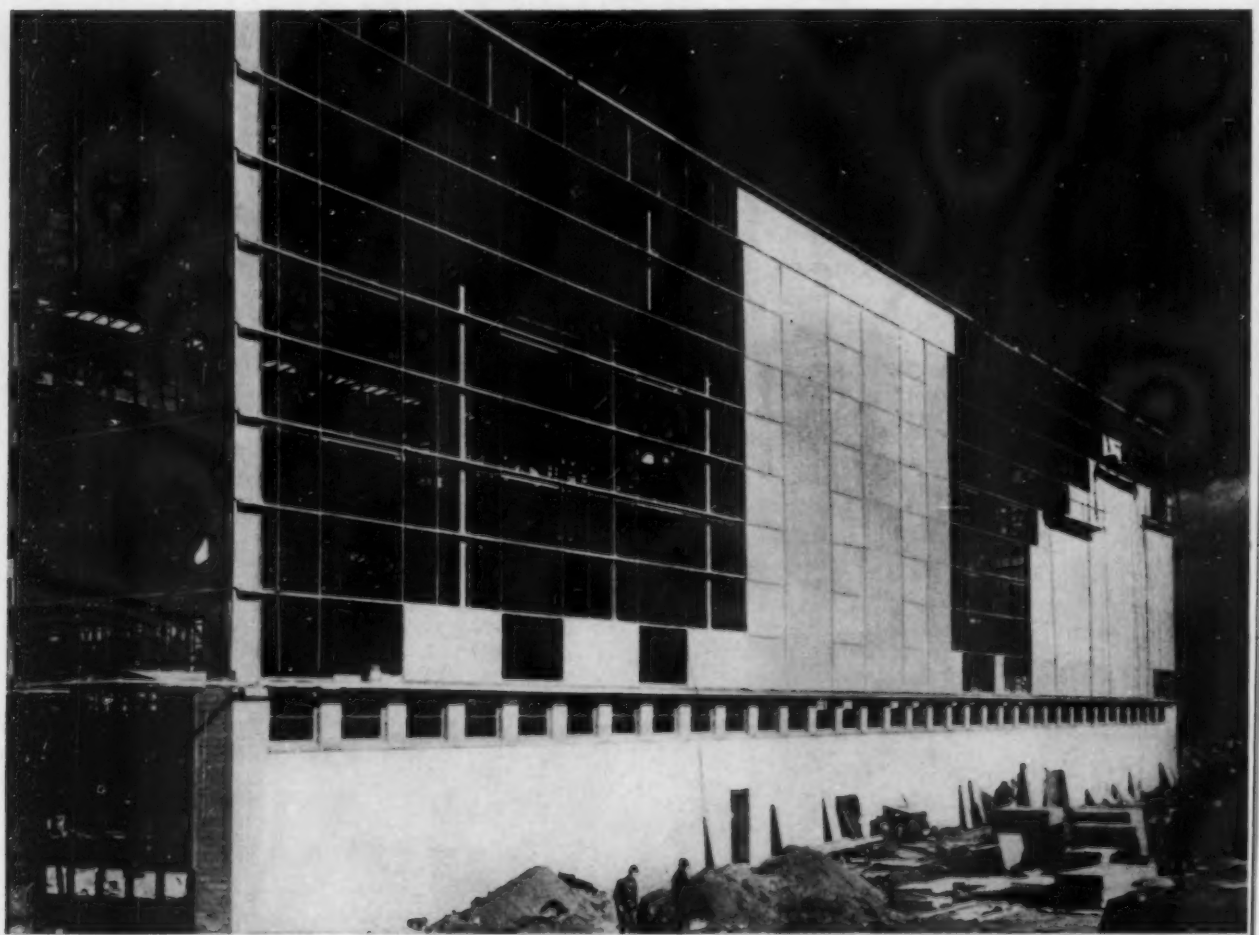
goes up quickly . . . lasts like stone

You can put up a new building or you can expand an existing structure... and meet the most exacting deadlines for completion... when your exterior walls are Johns-Manville Corrugated Transite. These big panels of asbestos and cement require minimum framing, cover large areas quickly, and are low in original cost. Once in place, these panels last like stone, with practically no upkeep because Corrugated Transite is corrosion-proof, rot-proof and fireproof.

FLAT TRANSITE, TOO. When building design requires a smooth-surfaced material with the same combination of characteristics, J-M Flat Transite is ideal. It was used with Corrugated Transite for the plant shown under construction, below, and completed, at right.



J-M Corrugated Transite handles easily, can be cut or drilled with standard portable high-speed rotary electric tools.

HERE ARE YOUR FACTS ABOUT J-M CORRUGATED TRANSITE... AND J-M FLAT TRANSITE

Width	42" (10 corrugations)	42" or 48"
Length	3' to 12' in 6" increments	4' or 8'
Thickness	Averages ⅜"	¼" to 1"
Weight	Normal 4.1 lbs./sq. ft.	Normal 4.0 lbs./sq. ft. for average ⅜" thickness

For further information call your nearest Approved Corrugated Transite Erector listed in the Yellow Pages under *Asbestos Products*, or write to Johns-Manville, Box 158, Dept. PE-760, New York 16, N. Y.

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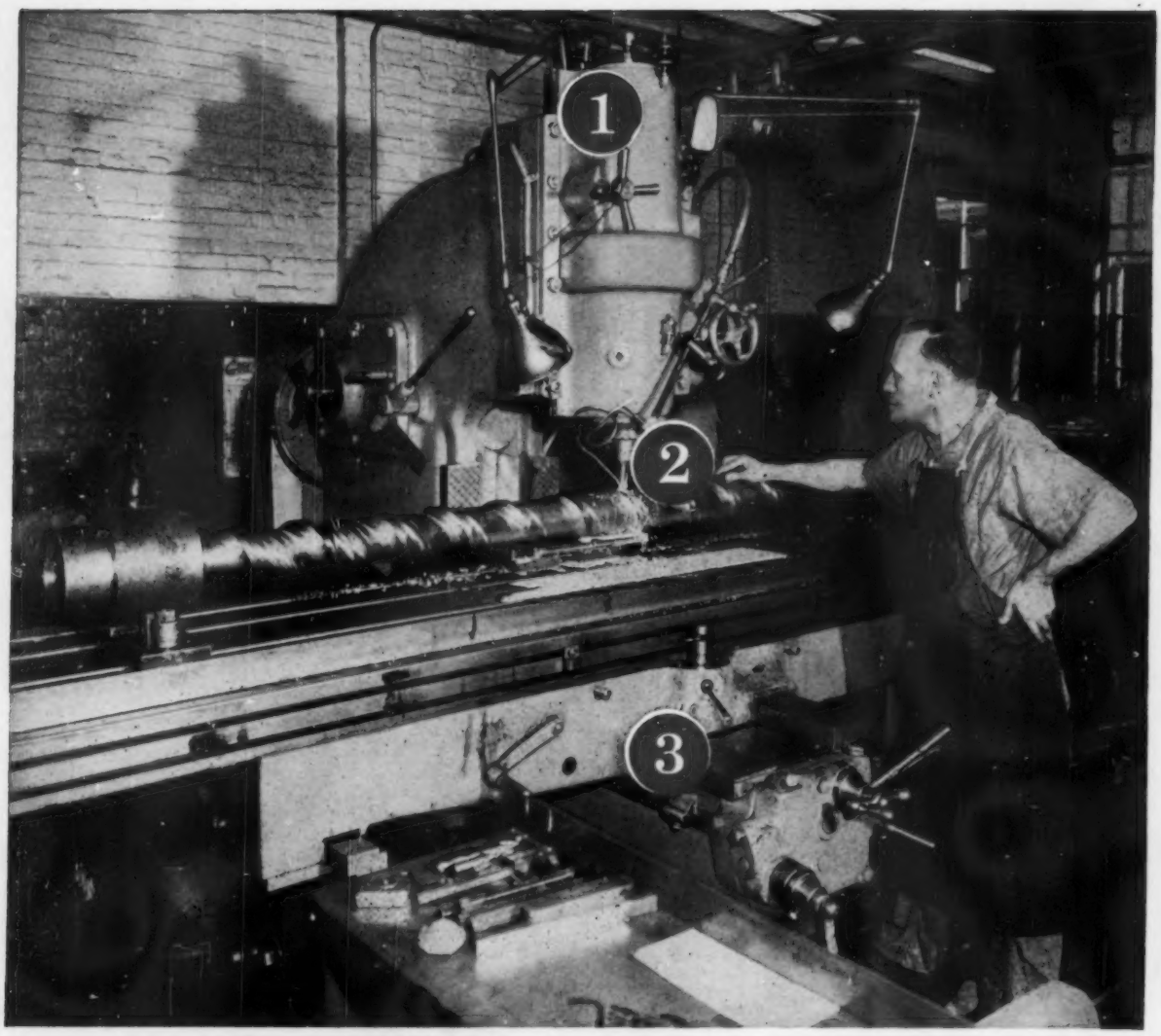

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There's a complete line of specialized Esso Lubricants to help improve your operations. Contact your local Esso office or write: Esso Standard, Division of Humble Oil & Refining Company, 15 West 51st Street, New York 19, New York.

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CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF A WELDED PLATE GIRDER

Standard rolled sections are so proportioned that for the moment resistance, the web may take shear and bearing loads much larger than are ordinarily encountered. For this reason it is usually possible to design an I-beam shape made up of plates or plates and angles so that the distribution of flange and web will be more efficient for a particular condition of load and span than any available standard rolled section.

Additional efficiencies of plate girders are that the flanges may be varied so that the resisting moment may approach the actual moment of the beam from point to point along the beam rather than just to have a single section designed to resist the maximum moment only. Creating a relatively thin web introduces problems of buckling of the web due to diagonal compression. This is overcome by the use of stiffeners.

While a plate girder may prove to be more efficient weightwise for a particular application, because of fabrication costs, a rolled section will most generally prove to be least expensive. The exception to this rule occurs when there is a long-span, heavily loaded member where a rolled section is available to resist the moment but where there is room to provide a beam deeper than 36 in. Even in this case there will have to be a remarkable difference in weights to overcome the fabrication costs. Of course where the section modulus required is larger than the strongest rolled section, the built-up or plate girder is necessary.

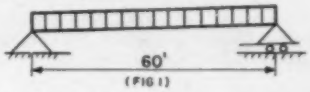
The following is an example of the design of a welded plate girder. Many of the principles have been developed in previous Briefs. The girder is to be used to span 60 ft.

Due to headroom requirements there is a limit of 72 in. from the top of the concrete slab of the balcony floor to the bottom of the girder. The balcony slab will be 6-in. reinforced concrete and be supported on beams that will frame into the girder. The beams will not be designed in this Brief and will not be shown in the design. There will be 2-in. minimum cover of concrete over the top flange of the girder. The balcony will cover an end bay 24 ft long. Therefore the girder will frame the other end.

Design

Governing Data

1. Sketch



(FIG 1)

2. Live Loads:
   300 lb/sq ft on balcony.
3. Design Specifications:
   AISC specifications for the design, fabrication and erection of structural steel for buildings.
4. Type of connections: All welded.

Design of Girder

1. Loads

Live: $300 \times 12 = 3600$ lb per ft

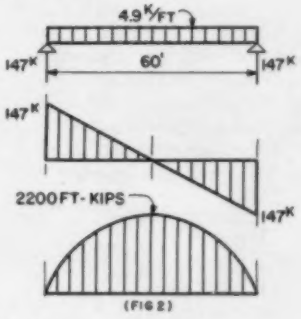
Dead: 6-in. concrete floor
$75 \times 12 = 900$ lb per ft

Beams: $4 \times 12 = 48$ lb per ft

Girder: (estimate) $= \frac{250}{4798}$ lb per ft

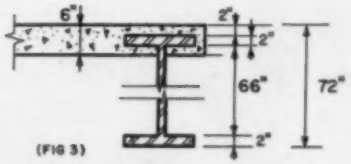
Say 4800 lb per ft

2. Shears



(FIG 2)

3. Moments
4. Preliminary Layout at Center of Girder



(FIG 3)

5. Design of Web
   The thickness of the web is determined by two requirements set forth in the code:

(1) $t >$ unsupported distance between supports/170

(2) $t > \frac{V}{13{,}000 \times \text{height of web}}$

For a welded girder, the unsupported distance between supports and the height of web are the same. In this case this value is 66 in.

$t > \frac{66}{170} = 0.389$ in.

$t > \frac{147{,}000}{13{,}000 \times 66} = 0.172$ in.

Since plates come in 1/16-in. increments up to 2-in., use 7/16-in. = 0.4375. Thus web will be 66 in. × 7/16-in.

6. Design of Flanges

(a) At the centerline, M = 2200 ft-kips.

The procedure will be to assume the use of 2-in. flanges here and solve for the width. If the width is reasonable it will be used.

$$I = \frac{Me}{f}$$

$$I \text{ (required)} = \frac{2200 \times 12 \times 1000 \times 35}{20{,}000} = 46{,}200 \text{ in.}^4$$

$$I \text{ (web)} = \frac{7}{16} \times \frac{66^3}{12}$$

$$I \text{ (flanges)} = \frac{10{,}600 \text{ in.}^4}{35{,}600 \text{ in.}^4}$$

The contribution of the moment of inertia of the flanges about their own axis may be neglected.

$$\text{Then } 2b \times 34^2 = \frac{35{,}600}{2}$$

$$b = 7.7 \text{ in.}$$

This is a disproportionally short width. Try 1⅛-in. flange thickness.

$$I \text{ (required)} = \frac{2200 \times 12 \times 1000 \times 34.13}{20{,}000} = 45{,}000 \text{ in.}^4$$

$$I \text{ (web)} = 10{,}600 \text{ in.}^4$$

$$I \text{ (flanges)} = 34{,}400 \text{ in.}^4$$

$$b = \frac{34{,}400}{1.125 \times 2 \times 33.57^2} = 13.55 \text{ in.}$$

use 14-in. × 1⅛-in. plates for the flanges in the center portion of beam.

It is good practice that the flange plate not be thinner than the web plate. It is then proposed to provide 14-in. × ½-in. plates for intermediate portions. The following are calculations for the location for the change of flange plate sizes.

Moment resistance of girder with 14-in. × ½-in. plate flanges:

$$I \text{ (web)} = 10{,}600 \text{ in.}^4$$

$$I \text{ (flanges)}\quad ½ \times 14 \times 2 \times 33.25^2 = 15{,}500 \text{ in.}^4$$

$$26{,}100 \text{ in.}^4$$

$$M_1 = \frac{20{,}000 \times 26{,}100}{12 \times 1000 \times 33.5} = 1300 \text{ ft-kips}$$

$$M = 147x_1 - \frac{4.8x_1^2}{2} = 1300$$

$$x_1^2 - 60x_1 = -531$$
$$x_1^2 - 60x_1 + 30^2 = -531 + 900 = 369$$
$$x_1 - 30 = \pm 19.2$$
$$x_1 = 10.8 \text{ ft}$$

Use $x_1 = 10$ ft, from each end.

Moment resistance of girder with 14 in. × ⅞-in. plate flanges:

I (web) = 10,600 in.^{4}

I (flanges)

$$⅞ \times 14 \times 2 \times 33.44^2 = 27{,}500 \text{ in.}^4$$

$$38{,}100 \text{ in.}^4$$

$$M_2 = \frac{20{,}000 \times 38{,}100}{12 \times 1000 \times 33.88} = 1870 \text{ ft-kips}$$

$$147x_2 - \frac{4.8x_2^2}{2} = 1870$$
$$x_2^2 - 60x_2 = -733$$
$$x_2^2 - 60x_2 + 30^2 = -733 + 900 = 167$$
$$x_2 - 30 = \pm 12.92$$
$$x_2 = 17.08 \text{ ft}$$

Use $x_2 = 16.5$ ft, from each end

7. Design of Intermediate Stiffeners

Intermediate stiffeners are plates placed in pairs (one on each side of web) to reinforce the web against buckling due to diagonal compression. Should there be points of load concentration coming down on to the girder, such as a column or a concentrated reaction (such as from a seated connection), then bearing stiffeners would also be required. There will be no necessity for bearing stiffeners in this problem for a single shear connection to the columns will be used.

The code requires that intermediate stiffeners shall be used if $h/t > 70$, where

h = the clear depth between flanges
t = the thickness of the web.

The stiffeners shall be used at all points where

$$v > \frac{64{,}000{,}000}{(h/t)^3}, \text{ where}$$

v = the unit shear

The distance between stiffeners, when required, shall not exceed 84 in. or that given by the formula

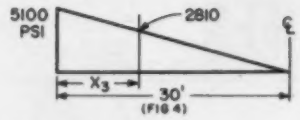
$$d = \frac{11{,}000t}{\sqrt{v}}$$

It is required that moment of inertia of the stiffeners taken about the centerline of web I_s be greater than $0.00000016\ H^4$, where H = total depth of web. For welded girders, h = H.

(a) Spacing requirements

$$\frac{h}{t} = \frac{66}{(7/16)} = 151$$
$$\frac{64{,}000{,}000}{151^2} = 2810 \text{ psi}$$

The total shear diagram of step 2 is converted to unit shear diagram of web by dividing by (7/16) (66).



(FIG 4)

$$\frac{30 - x_3}{30} = \frac{2810}{5100}$$
$$30 - x_3 = 16.5$$
$$x_3 = 13.5 \text{ ft}$$

This means that stiffeners are required only in the end 13.5 ft of the girder.

Spacing:

$$d_1 = \frac{11{,}000 \times 7/16}{\sqrt{5100}} = 67.4 \text{ in.}$$

Say 66 in.

$$v \text{ at this point} = \frac{24.5}{30} \times 5100 = 4170 \text{ psi}$$

$$d_2 = \frac{11{,}000 \times 7/16}{\sqrt{4170}} = 74.5 \text{ in.}$$

Say 72 in.

$$v \text{ at this point} = \frac{19.5}{30} \times 5100 = 3320 \text{ psi}$$

$$d_3 = \frac{11{,}000 \times 7/16}{\sqrt{3320}} = 83.6 \text{ in.}$$

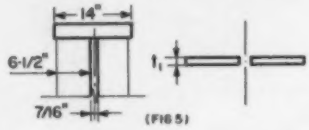
Use maximum value, 84 in.

Since these go into the area where stiffeners are not needed, these are then all the stiffeners required.

(b) Size of stiffeners

The stiffeners should extend as close to the edge of the flange as possible, without extending beyond it.

Therefore use 6½-in. plate.



(FIG 5)

I_s (required) = $0.00000016\ (66)^4 = 3.04$ in.^{4}

$$I_s = \frac{2t_1\ (6.5)^3}{12} + 2t_1\ (6.5)\ (3.47)^2$$
$$3.04 = 45.8t_1 + 156.5t_1$$
$$t_1 = \frac{3.04}{202.3} = 0.015 \text{ in.}$$

Use 6½-in. by ¼-in. plate

8. Design of Welds

(a) Web to flange. Pairs of ⅜-in. fillet stitch welds, 2 in. long, will be used. The maximum spacing determined for the ends will be used throughout.

The capacity of a pair of ⅜-in. fillet welds, 2 in. long, is:

W = 14.4 kips

$$vb = \frac{VQ}{I}$$

At the ends,

$Q = 14 \times ½ \times 33.25 = 233$ in.^{3}

I = 26,100 in.^{4}

V = 147 kips

$$vb = \frac{147 \times 233}{26{,}100} = 1.31 \text{ kips per in.}$$

Centerline spacing of stitch weld

$$= \frac{14.4}{1.31} = 11 \text{ in.}$$

Therefore clear spacing equal 9 in. The minimum clear spacing as required by code for the compression flange is 16 times the thinnest section joined, or $16 \times 7/16 = 7$ in.

Therefore, use 7-in. clear spacing or a 9-in. centerline spacing with a ⅜-in. fillet weld, 2-in. long, throughout the section.

(b) Stiffener to web

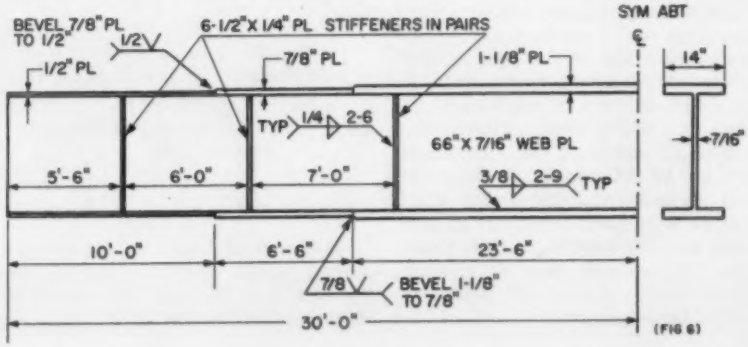
Here, use pairs of 2-in. long ¼-in. fillet stitch welds. Since the stiffeners are in compression, maximum clear spacing also is $16 \times ¼ = 4$ in.; therefore use 4-in. clear spacing or 6-in. centerline spacing of ¼-in. fillet weld, 2 in. long, for fastening the stiffner to the web.

9. Sketch. See Fig. 6

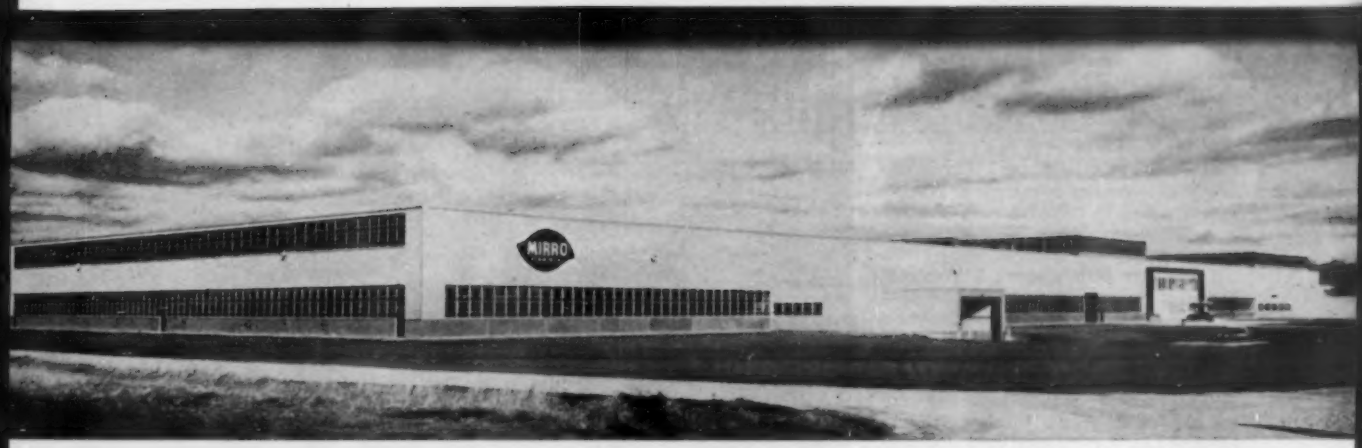
10. Summary

The 60-ft-long web plate will probably be made up in two or more pieces. These will be spliced by a full butt weld.

Since this is part of an alteration, the connection to the column will depend upon structural makeup of the column. A step column may be necessary and also a revision in the column footings.



(FIG 6)



New Mirro Aluminum plant can double production without changing electrical system

J-94147-1

PRECEDING PAGE

At top, Mirro Aluminum's handsome new rolling mill at Manitowoc, Wis., is appropriately sheathed in maintenance-free aluminum siding.

At bottom, men who helped Power-Up the new mill inspect a Westinghouse 1000-kva Type ASL ventilated dry-type power center which feeds power to productive equipment. Space has been provided in power center for additional drawout Type DB feeder breakers when needed. On power center platform: W. E. Reimer, Uihlein Electric Co.; J. R. Miller, Westinghouse Construction Engineer; and V. E. Mulvaney, Westinghouse Sales Engineer. Standing below: Roy Angrick, Chief Construction Engineer, Klug & Smith Co.; Edwin Zagrodnik, Mirro Rolling Mill Superintendent; M. E. Hutchins, Mirro Project Engineer and Metallurgist; and H. E. Toll, District A&S Manager, Westinghouse Electric Supply Co.

AT RIGHT

In coil slitting area, a 45-kva DT-3-B dry-type transformer with attached primary circuit breaker is mounted at the load to provide 120/208-volt power for lighting. Maintenance-free, lightweight Westinghouse transformers are easily mounted off the floor. On side of control cabinet: a 225-amp, J-frame Westinghouse AB-I circuit breaker which protects control unit. Talking over plant's electrical system: J. R. Miller, H. E. Toll, Roy Angrick and W. E. Reimer.

J-94147-2

Imposing line-up of 5-kv indoor metal-clad switchgear with Type DH drawout air circuit breakers. Used for control of mill's synchronous and induction motors, they are also used to protect feeder circuits to power centers throughout the plant. (At left) Low-voltage drawout switchgear end of a 1000-kva power center. Messrs. H. E. Toll, W. E. Reimer and M. E. Hutchins inspect 50-DH-250 main breaker compartment.

Westinghouse power system planned for today's . . . and tomorrow's production

The progressive Mirro Aluminum Company has taken a big step forward in its long-range expansion program. Recently completed: a heavy-duty, fully integrated aluminum rolling mill at Manitowoc, Wis., covering 238,818 square feet. Present annual capacity: 60 million pounds of aluminum for use in cookware, electric housewares, boats, foil, toys, and component parts for industry. Anticipating Mirro's production goals and planned product diversification, plant output can be doubled . . . *with no major alterations in the plant's electrical system.*

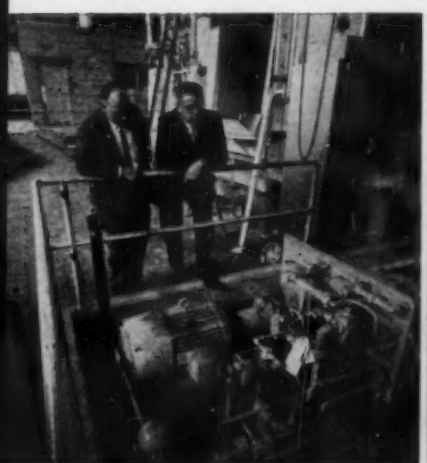
Westinghouse, working closely with Mirro representatives, the consulting engineer and electrical contractor, participates in the design of a plant system that's adequate for today, ready for tomorrow. Standard Westinghouse apparatus, capable of meeting the stringent requirements of process equipment, was specified for the primary distribution system. Eliminated was the need for expensive, specially engineered or custom-built apparatus.

The planning team found that a simple, modified, modern radial distribution system using 5-kv Type DH breakers feeding individual power centers at main points of load would best serve the plant. Distributing high-voltage power, this type of system reduces losses, cuts feeder circuit costs and improves voltage regulation. A definite requirement of process equipment switching was drawout Type DB, heavy-duty circuit breakers which can be easily inspected and maintained.

Realizing that every possible inch of floor space should be productive, the team chose Westinghouse equipment that could be installed in out-of-the-way areas yet provide on-the-spot power. For example, the maintenance-free, ventilated dry-type power center transformers are approximately 33% lighter than liquid units of same ratings. They can be mounted on overhead platforms or balconies near the loads served, but out of productive areas. Aluminum busbars in the switchgear also reduce weight and require smaller platforms to support the power center. *(cont'd.)*

YOU CAN BE SURE... IF IT'S Westinghouse

J-94147-3



At aluminum casting station, a 30-hp, totally enclosed, fan-cooled Westinghouse Life-Line® "A" motor drives a hydraulic pump. Sealed, prelubricated ball bearings eliminate greasing, while Bondite-Mylar* insulation means longer motor life, longer continuous production. Roy Angrick and V. E. Mulvaney check the installation.

*Du Pont registered trade-mark

W. E. Reimer explains to H. E. Toll and Edwin Zagrodnik how 4160-volt, unfused, 600-amp, Westinghouse Type LCB switch serves as a disconnect switch for drive motor in plant's 800-hp foil mill motor-generator set. Switch is wall mounted to save space. Westinghouse oiltite pushbutton station remotely starts motor at metal-clad switchgear.

Power comes to Mirro's plant at 67,000 kv and is stepped down to 2520/4360 volts by three Westinghouse 2500-kva, Type SL, single-phase transformers. (Fourth unit is a spare.) Transformers are protected by Westinghouse-developed Insuldur®, the ultimate in insulation, which allows peak period overloads without damage. Shown are M. E. Hutchins, V. E. Mulvaney and Edwin Zagrodnik.

DH-250 main breaker compartment.

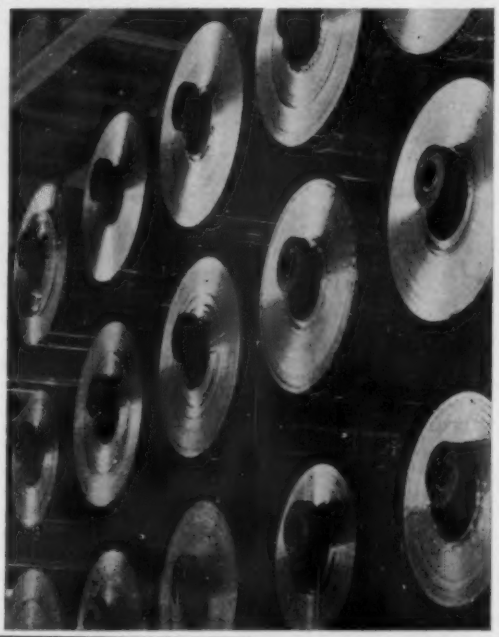
Necessary 480-volt power for plant is carried from small, outdoor transformers to indoor switchgear by weatherproof, low-impedance, 1350-amp Westinghouse bus duct that assures high efficiencies of feeder circuits. Tap openings conveniently spaced along duct provide easy means of connection to power company transformers.

Westinghouse Powers-Up Mirro Aluminum plant *(cont'd.)*

In industrial plants, Powering-Up electrically with an eye on today's *and* tomorrow's needs can mean outstanding benefits and savings. For information about how Westinghouse can help you Power-Up, see your nearest Westinghouse distribution outlet . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa.

OWNER: Mirro Aluminum Company, Manitowoc, Wis.
CONSULTING ENGINEER and GENERAL CONTRACTOR: Klug & Smith Co., Milwaukee, Wis.
ELECTRICAL CONTRACTOR: Uihlein Electric Co., Milwaukee, Wis.
WESTINGHOUSE DISTRIBUTOR: Westinghouse Electric Supply Co., Milwaukee, Wis.

Gleaming spools of aluminum foil produced in new Mirro rolling mill are ready for retail packaging for consumer use.



J-94147-4

YOU CAN BE SURE...IF IT'S Westinghouse

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

For more facts circle 559 on Reply Card

A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:
- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____

Fir plywood vault components were the key to low cost and high strength of this loading dock roof at Foremost Dairies, Seattle. Construction went fast because of the light weight and large size of prefabricated roof parts. In-place cost of the 260-ft., 12-bay roof was less than thin-shell concrete or a conventionally framed flat roof with the same span. Components were 4x13-ft. arched stressed skin plywood panels. Besides economy, the plywood vaulted roof system offers strength, rigidity and many design variations.

Overlaid plywood acid tanks at St. Louis Lithographing Co. cost less than lead or stainless steel, weigh less, and are easier to build and maintain. Resin-fiber overlay, permanently fused to waterproof plywood, is smooth, hard and highly acid-resistant.

Plywood tote trays reduced chances of damage in transit for IBM shipments of precision parts to the Rochester, Minn. plant. Plywood's large panel size and workability made it possible to design, quickly and economically, several tray types to give maximum protection to various sizes of parts. Plywood is strong and rigid, yet light-weight and low-cost to ship.

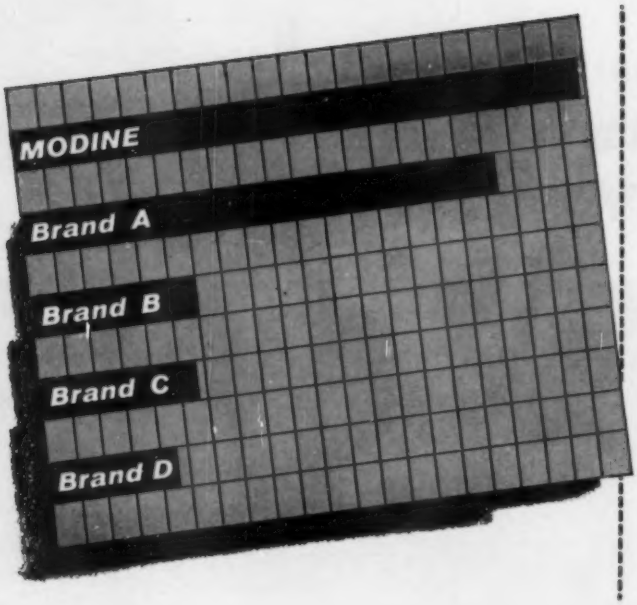
FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION
TACOMA 2, WASHINGTON
—an industry-wide organization devoted to research, promotion and quality control

DFPA TESTED QUALITY

Always specify by DFPA grade-trademarks

For more facts circle 560 on Reply Card

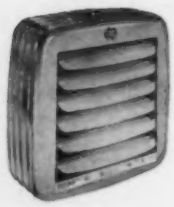


The chart represents the results of a steam and hot water unit heater survey made by a leading industrial magazine. In answer to the question "Which brand do you prefer?", Modine was a solid . . .

FIRST CHOICE

among men who buy unit heaters

HORIZONTAL
Can be direct-from-pipe suspended . . . without other supports. Vertical louvers may be added for complete directional control. 24 sizes.



VERTICAL
Available in 28 sizes . . . choice of 4 air deflectors. Depending upon size selected, mounting height may vary from 10 to 60 feet.

POWER-THROW®
For hard-to-heat locations. High-velocity discharge assures exceptionally long heat-throw . . . up to 140 feet. Offered in 10 sizes.

For over thirty years, Modine steam and hot water unit heaters have been a consistent first choice for commercial and industrial applications. They're ideal for new buildings or modernization . . . pay off in perfect comfort, at low fuel costs, with minimum maintenance.

Here are just a few of the features of Modine's line: attractive styling; three distinct designs . . . horizontal, vertical, Power-Throw; lightweight, yet extremely durable construction; high capacity on steam or hot water systems; die-formed casings; a complete line of low-outlet-temperature models for high pressure systems; extra-heavy die-formed fins for added strength and maximum heat transfer; vertical fin design that discourages accumulation of dust and dirt.

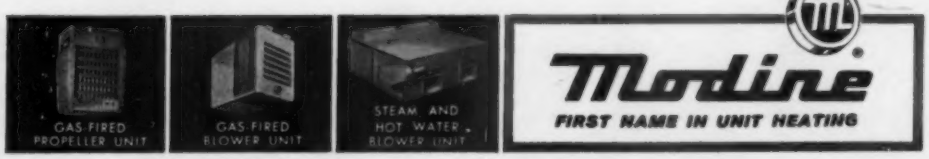
CATALOG 158 *contains full details. See your distributor or write Modine Manufacturing Co., 1563 DeKoven Ave., Racine, Wisconsin.*

In Canada: Sarco Canada, Ltd., Toronto, Ont.

Immediate delivery from local stock! Modine wholesalers are located in all principal cities. Call the Modine representative nearest you . . . he's listed in the yellow pages.

SU-1388

Also from the world's most complete unit heating line



For more facts circle 561 on Reply Card

NEW...

with capacities to 50 hp!

LINK-BELT

RS P.I.V.

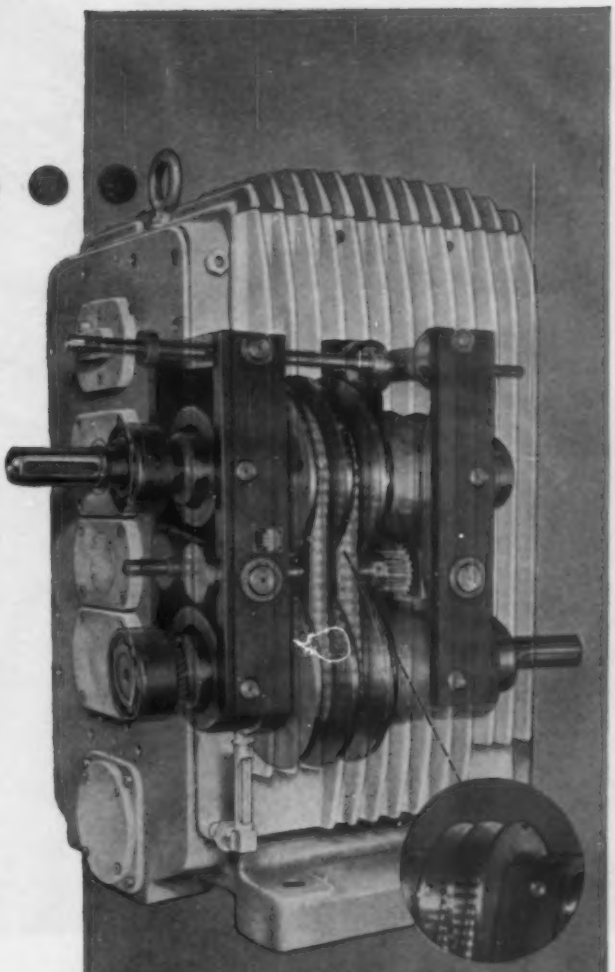
VARIABLE SPEED DRIVES

All-metal drives use single-roll chains to achieve positive, stepless, infinitely variable speed control

With a unique chain design and force lever system, Link-Belt RS P.I.V. drives represent a major advance in direct-drive variable-speed transmission. It's the most compact mechanical 50 horsepower variable speed drive on the market.

Twin strands of high-load capacity chain operating between opposing conical wheels permit extreme compactness. The effective diameters of the wheel faces are altered during operation, changing their ratio and the output shaft speed accordingly . . . providing smooth, positive, accurate speed adjustment between maximum and minimum settings. Constant hp or torque is maintained over the complete speed range.

Link-Belt RS P.I.V. drives are all-metal and pressure-lubricated. Capacities to 50 hp, with speed variation ratios up to 5.5:1. For full details, contact your nearest Link-Belt office or authorized stock-carrying distributor. Ask for new Catalog 2874. 15,200



RS-33 P.I.V. with twin chain arrangement for capacities to 50 hp. Inset shows close-up of unique all metal single roll chain construction.

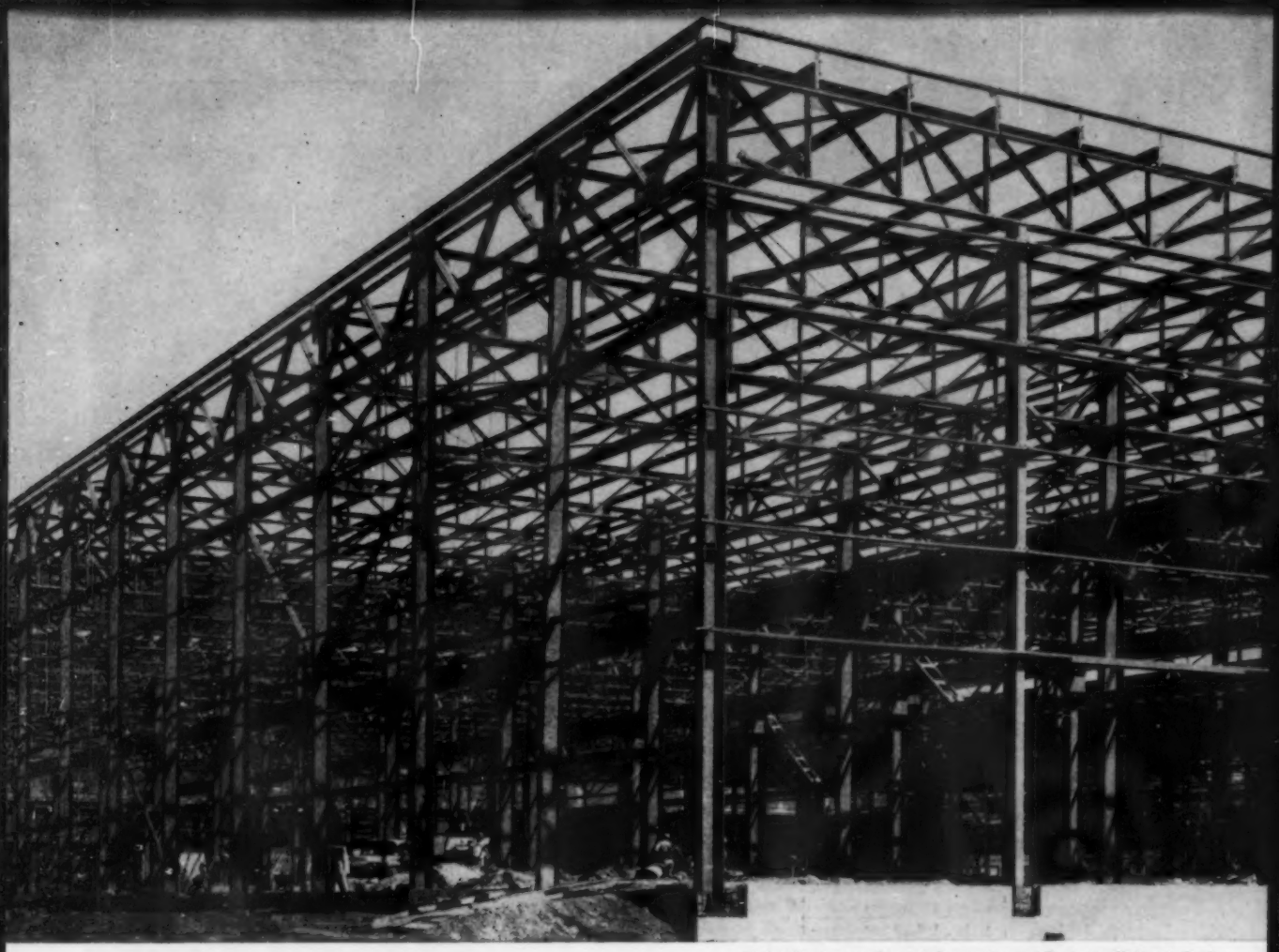
47-ROLL PAPER-MAKING MACHINE uses Link-Belt RS P.I.V. on primary drive. The RS P.I.V. powers a two-speed gear drive which enables paper speeds to be varied over two ranges . . . 4 to 16 yards per minute and 12½ to 50 yards per minute.

LINK-BELT

P.I.V. VARIABLE SPEED DRIVES

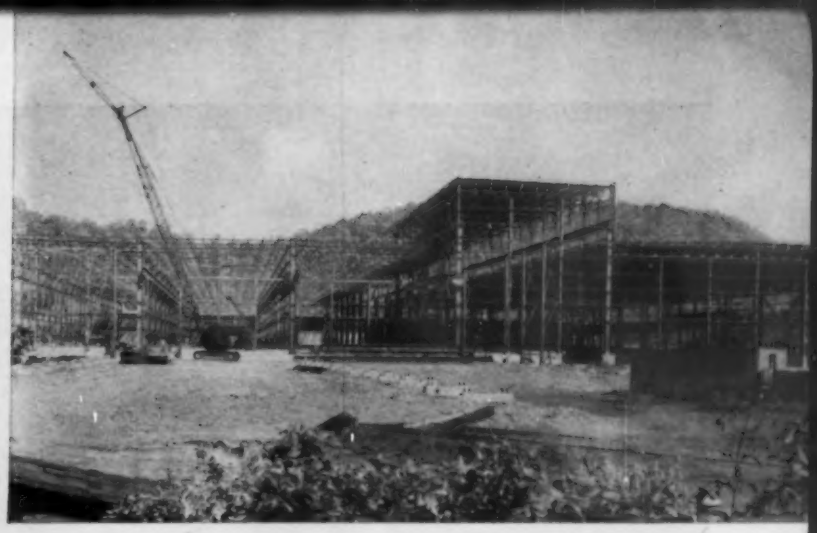
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

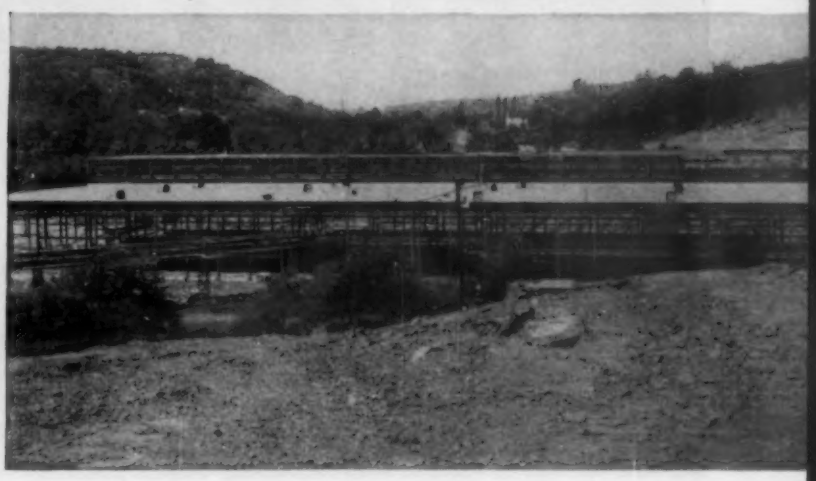
For more facts circle 562 on Reply Card



Kaiser Engineers, General Contractor and Engineer, Oakland, Calif.

New Westinghouse Plant





fabricated and erected by American Bridge

Recently, American Bridge constructed a new Power Circuit Breaker Plant and Exterior Crane Runway at Trafford, Pennsylvania for the Westinghouse Electric Corporation. The building measures 420′ x 584′, the crane runway 334′ x 116′2″ and the entire job took 2,576 tons of steel. All connections were made by bolting and welding. ☐ Structural steel is ideal for industrial construction because its ease of fabrication permits complete design freedom. Structural steel also assures utmost strength and safety at a very reasonable cost. For your future industrial buildings, contact the nearest American Bridge contracting office for the facts on our services and facilities.

USS is a registered trademark

General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore. Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

American Bridge Division of United States Steel

USS

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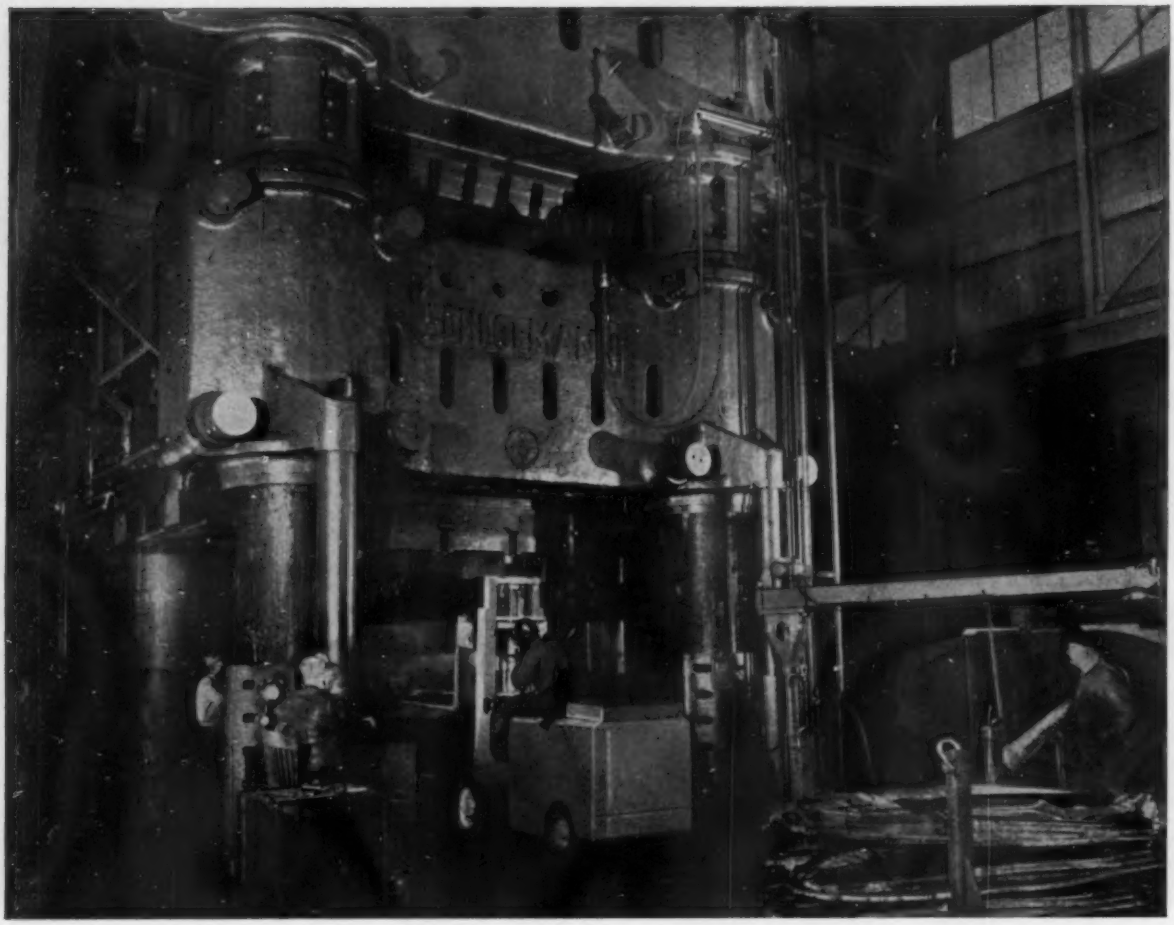

Get full production from electric trucks— Power with C&D *Slyver-Clad®* batteries!

Records from many types of operations prove electric trucks are best for materials handling operations requiring industrial trucks. And when you power them with premium C & D *Slyver-Clad®* batteries, you get maximum capacity per unit of space. This in turn means continuous, full-production, without power letdown at the end of a shift.

In addition, C & D premium *Slyver-Clad* batteries have *Hi-Impac* cell covers and containers. This *exclusive* C & D feature alone virtually eliminates taking a truck out of service because of physical damage to the battery.

C & D batteries have Five-Fold *Slyver-Clad* insulation and retention that assures maximum life with full capacity to the end of that life, plus *AccuPak®* plates that are automatically pasted and 100% inspected by AccuRay**. They are the longest, thickest plates available in any industrial battery. You get built-in extra life and the AccuRay inspection eliminates any possibility of trouble because of low cells.

C & D premium *Slyver-Clad* batteries are available with capacities from 225 to 2175 A.H. at the six hour rate and in any standard tray arrangement. Write for Bulletin IT-528 and see why *—C & D is your better battery buy.*

C&D C & D BATTERIES
of Conshohocken, Pa.... Attica, Ind.
DIV. THE ELECTRIC AUTOLITE CO.

Manufacturers of Slyver-Clad® Industrial Batteries • PlastiCell* and PlastiCal® Batteries for Communications, Control, and Auxiliary Power • Producers of AutoReg® Silicon Chargers and AutoCal* Charger-Battery Combinations

*Ⓡ *Trademark, C & D Batteries Div. The Electric Autolite Co.*
** *Trademark, Industrial Nucleonics Corp., Columbus, Ohio*

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WHAT'S JUST AHEAD IN THIS ISSUE?

- POWER COSTS can be "squeezed" and to prove it here is a story of how American Cyanamid is saving $40,000 a year by careful analysis of all the factors involved. They kept an accurate record of power consumption and made corrective changes, based on these records. The result: the above mentioned $40,000 in savings. For the complete story, turn to page 102.

- VARIOUS TYPES of materials handling systems and equipment have been incorporated in the new Link-Belt bearing plant in Indianapolis. Some unusual equipment includes outrigger trucks equipped with their own conveyors, a special overhead crane for handling stackable racks, and dispatching of tote baskets by pin coding. For a full description of this handling setup, turn to page 110.

- ARE YOU considering air conditioning? If so, you will want to make a study of your facilities as suggested in the article beginning on page 113 to determine what system will best serve your needs and give you the most efficient performance. The three-step approach outlined in this article will provide you with a good basis on which to make your final decision.

- MONITORING of plant processes by means of a sun-powered transmitter may be nearer to actual plant use than many of us think. A number of these transmitter units being installed on a Los Angeles turnpike will enable a person to call for help by merely pushing a button. A modification of the system can be applied to industrial process work. For a complete explanation of how this equipment works, see page 122.

- RELIABILITY is an important feature of emergency shutoff valves. To be sure that you are buying this in addition to other valve features, the author has set down criteria for approval and discusses the various types and operation of this equipment. The article begins on page 128.

- DESIGNED specifically for shipping maintenance parts—particularly delicate ones—is a knockdown box system developed by North American Aviation. Modular panels permit many different sized boxes to be made up from relatively few panels. The packaging system has cut in-transit damage by 89 per cent. More details about this knockdown box will be found on page 132.

- WHITE PAINT can save part of your lighting dollar, as well as your painting dollar, and still return more value in improved lighting. A number of examples are presented in the article starting on page 140 to show how the use of higher reflectance white paints can give your lighting system a welcome boost.

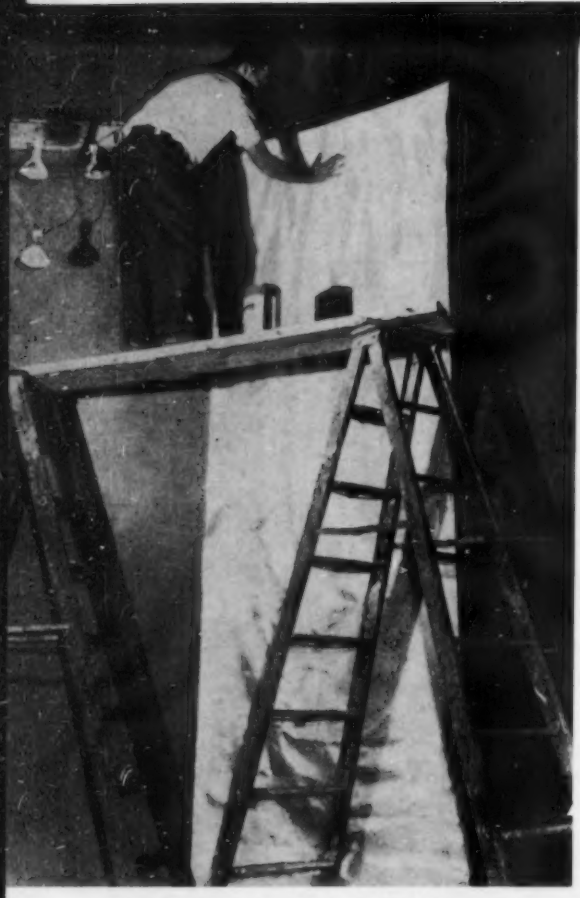


Fig. 1. After surface is cleaned and first resin coat applied, glass cloth is hung from top of wall and lightly smoothed against the tacky resin surface.

GLASS CLOTH PLUS RESIN GIVE TANK A TOUGH INNER COAT

Here is a step-by-step description of how the coating is applied

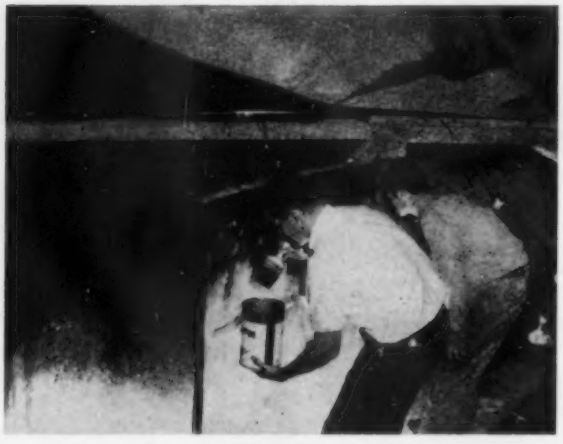


Fig. 2. After glass cloth is applied to wall, it is thoroughly saturated with resin and major air bubbles are drawn out.

LINING A metal surface with glass-reinforced polyester resin requires a number of specific steps to insure that the over-all area is properly covered. The tank-lining project handled at the plant of Foote Mineral Company in Knoxville, Tennessee, demonstrates the proper technique of applying this glass cloth-resin coating.

This tank is used for storing anolyte solutions, with highly corrosive properties. Tank dimensions are 20 ft in diameter by 12 ft high. The installation was done by Justin Enterprises, Inc., on a sub-contractual arrangement for S & C Manufacturing Co., Cincinnati, Ohio.

One of the important factors in tank lining is temperature. When the tank was lined, the outside temperature, approximately 35 to 40 F, was too cold for the proper setting of the resin. The temperature inside the tank was raised to approximately 80 F by enclosing the total tank in a large tent and placing portable heaters inside the tank.

Resin utilized in lining the tank was a Bisphenol A polyester, called Atlac 382, a product of Atlas Powder Company, Wilmington, Delaware. This polyester, which has properties approaching those of epoxies, features extreme corrosion resistance under a wide range of conditions.

First step in lining a metal surface is cleaning by sandblasting. This operation is extremely important because the presence of dirt or film on the surface will diminish the effectiveness of the coating. Immediately following sandblasting, a coat of resin must be placed on the complete interior of the tank to prevent oxidation of the metal surface.

In the next step, a coat of polyester resin is placed over the prime coat to bond a combination of glass cloth and 1½-oz glass mat to the tank surface. The resin for this particular installation was applied manually by brush. However, it can be applied by a spray gun.

The glass-bonding resin coat is applied to one section of the wall at a time. Each section runs the length of the wall and is just the width of the glass cloth and

mat. The glass cloth and mat combination is then hung from the top of the wall and lightly smoothed against the tacky resin surface, Fig. 1. This is done immediately after resin has been applied to assure contact with the resin before it has set.

In formulating the resin, a minimum of accelerator is used in the resin compound so that the curing rate is relatively slow. No attempt is made at this time to get the area under the cloth completely bubble-free. After it has been applied to the wall, the glass cloth is thoroughly saturated with resin, and the major air bubbles are worked out from under the fabric with squeegees or rollers, Fig. 3.

Coating, Smoothing Operations

When the whole strip of cloth is held in place, it is given a resin coating and final smoothing. The purpose of this operation is to assure that the entire cloth surface has been coated with resin and firmly pressed against the tank to eliminate all possible air bubbles, thereby preventing any defects.

Coating and smoothing is done in sections down the tank wall. Each section runs approximately three feet down the wall and is the width of the glass cloth. When a section has been completed, the workmen drop the scaffold and start coating and smoothing the section below. This system provides not only convenience, but also assures that every section has been thoroughly covered.

Any area in the cloth that has not been thoroughly penetrated by the resin will allow chemical attack through the dry glass. If the cloth is not firmly bonded to the tank, temperature changes are likely to start the cloth cracking away from the tank surface and cause a weak spot. The prime coat of resin applied to the tank surface after sandblasting is too thin to give maximum protection. A pinhole can cause complete tank failure. The cloth is finally smoothed and lapped onto the bottom of the tank, Fig. 4.

When the resin coat has cured, the entire interior of the tank is inspected inch-by-inch with a high-voltage probe, Fig. 5. A hole or weak spot in the resin will cause an electric arc to jump from the probe to the tank wall. These weak spots are then marked and resin and additional glass are applied to the area in question to eliminate any possible defect.

In this application, not a pinhole was found, even though the outside temperature was low and the size of the tank was large. The non-existence of defects was achieved by great care during the lining operation.

After completion of the arcing test, two additional layers of resin are placed on the tank surfaces, often in conjunction with a 10-mil glass surfacing mat, to provide a gel coat or resin-rich surface, which is so important for protection against corrosion. **End**

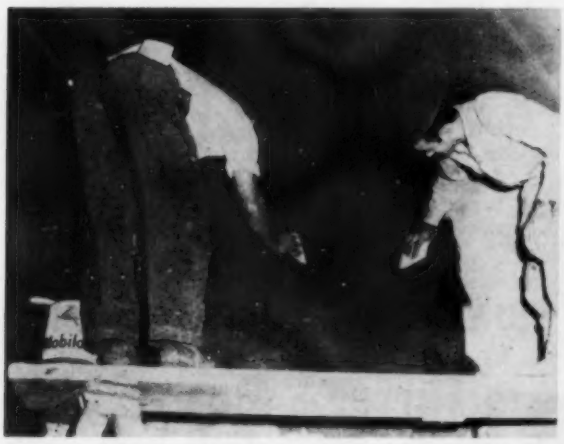


Fig. 3. Above: Saturated cloth is given final smoothing. Coating and smoothing should progress in three-foot sections.

Fig. 4. Cloth must be securely bonded to the metal, or temperature changes will cause it to crack away from surface.

Fig. 5. After resin coat has cured, interior is inspected with high-voltage probe. Additional resin is placed over defects.

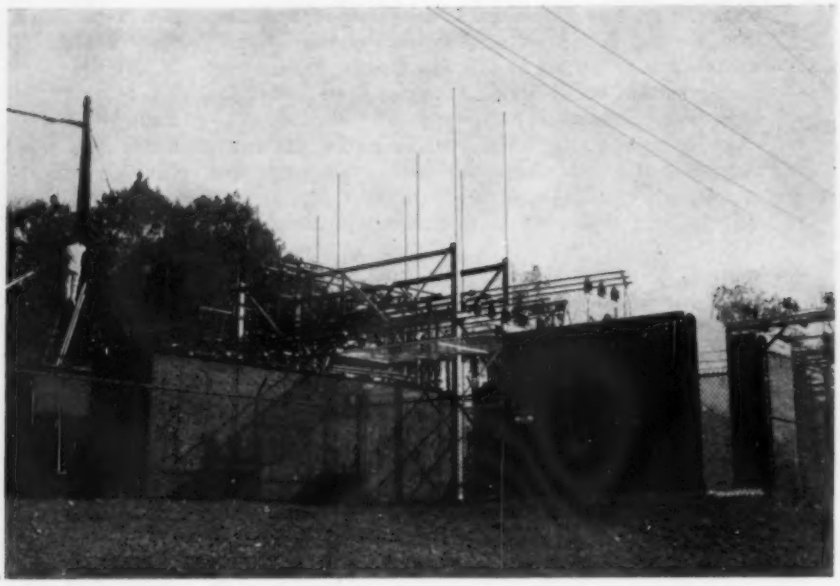


Fig. 1. Main substation consists of two 15,000-kva transformers which transform the incoming 33 kv to 4160 volts for in-plant distribution. Two 1200-kvar capacitor banks shown at right.

SQUEEZING POWER COSTS

By JOHN R. LATHAM, Engineering Department, Lederle Laboratories, American Cyanamid Company, Pearl River, New York

SQUEEZING your power bill is just another way of saying that you are operating your power system at its highest efficiency. Only two things are needed to put the squeeze on your power bill. One of these is complete and accurate records of power consumption and the other is a knowledge of what to do about situations revealed by these records.

Before we get into the details of improving the efficiency of a power system it might be well to present a brief description of our power distribution system and the billing schedule under which we operate. As we are billed on a kilovolt-ampere demand, anything less than unity power factor results in higher demand costs. The charges for energy are also tied to demand and it is important to keep the power factor as high as practical to reduce the billing demand. Our billing demand last year ran from a low of 8640 kva in the winter to 11,520 kva in the summer. Energy consumed ranged from 3,896,000 kwh in the winter to 5,752,000 kwh in the summer.

All electric power is purchased from a local utility company as we do not have the proper heat balance to justify generation or even peak shaving at the present time. Our engineering department periodically makes studies to keep abreast of changes within the plant so that our eyes are kept open to the possibilities of power generation.

Distribution System

Power is brought to the plant on two transmission lines operating at 33 kv. A power company substation, located adjacent to our property is equipped with two 15,000-kva transformers to reduce the incoming voltage to 4160 volts, Fig. 1.

Two overhead busses lead from the secondary side of the transformers and tie into our main feeder circuit breaker cubicles. Switching is arranged so that either transformer can supply one bus, both busses or be paralleled on one bus. This substation is a joint venture from the point of view that the main feeder breakers, connected directly to the power company 4160-v bus, are maintained and operated by a separate section of our maintenance department.

A valuable asset to our operations is the fact that the power company meter house is open to our authorized personnel. Meters that we frequently refer to are the billing meter, a kilovolt-ampere demand meter; recording kilowatt and reactive kilovolt-ampere meters and a recording voltmeter, Fig. 2.

Our distribution system is a radial system with pairs of feeders looped together, operating at 4160 volts, grounded neutral. Twelve feeders, routed throughout the plant supply 25 substations generally consisting of a 500-kva power transformer and a 300-kva lighting transformer with all the necessary primary and secondary switchgear, Fig. 3.

Power and lighting systems are segregated mainly to keep motor disturbances off of the lighting system. A good portion of our plant is devoted to research and most of our research equipment is fed from the lighting system.

We also tie our larger 4160-v motors to the primary feeders through G & W oil switches. Motors 125 hp and above are usually oper-

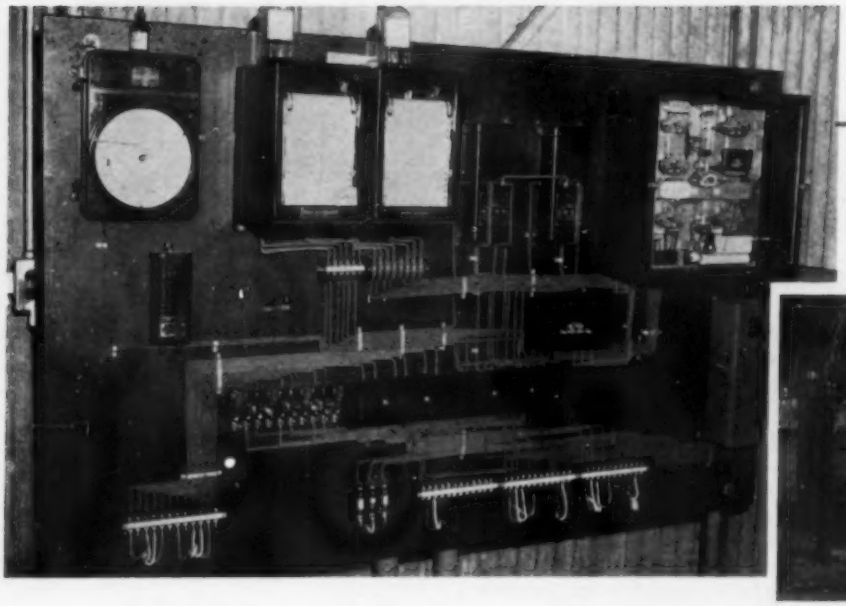


Fig. 2. Power company metering board furnishes valuable information for analysis of power consumption efficiency.

Fig. 3. Typical outdoor substation consisting of 500-kva power transformer and 300-kva transformer for lighting.

ated on the 4160-v system. At present, we have 15 synchronous motors totaling 6050 hp operating on 4160 v. Nine of these are 0.8 leading power factor machines and the remaining six, amounting to 3600 hp, are all unity power factor machines.

We also have seven, 4160-v induction motors totaling 1300 hp that have been used where synchronous machines were not applicable. These motors vary in size from 125 hp to 1000 hp.

Our distribution system is maintained and operated by a group of four men who are delegated to this work. They are equipped with all of the essential equipment for their work such as Meggers' high potential testing sets, recording ammeters, voltmeters, kw and kva meters and power factor meters, both clamp type and recording. Fig. 4.

A recording telemeter is installed at the desk of the chief operator to give a continuous picture of the plant kva at all times. Operation of all high voltage machines, particularly the synchronous motors, is under the control of the system operator for the purpose of peak demand control.

Quite often, additional air conditioning load can be held off the line until a likely peak period has passed, or other units can be shut down to permit the operation of a more essential piece of equipment. By this method we have been able to keep peaks down and reduce power costs substantially. As an example, should one of the 700-hp motors be started at the wrong time it might well establish the billing peak to the tune of $1600 for that particular month.

The operating group works closely with the electrical engineering section where system planning and forecasting of power requirements are made. Each month, the power company charts are sent to the electrical engineering department for close scrutiny to determine if improvements can be made.

Back some 10 years ago, our plant load was approximately 3500 kva and our power factor was well up in the nineties. This high power factor was largely due to the corrective contribution of four 0.8 lead pf, 125-hp pond water pumps and two 0.8 lead pf, 300-hp air compressors. Changes in operating procedures came rapidly as the plant load increased.

Expansion of plant operations resulted in a need for large quantities of compressed air and steam. A study was made on the economics

Fig. 4. Recording and indicating voltage, current and power factor meters used to decide power factor correction.

of a steam driven air compressor compared to one using an electric drive. In this instance, the steam turbine drive proved the better choice. This also meant that our leading power factor air compressor drives would now only be used as standby units to back up the turbine when it was down for overhaul.

We also began to feel the effects of changes in process operations and the loading of motors dropped off considerably. In some cases, we replaced larger motors with smaller units where load tests showed this was a paying proposition.

During this period of plant expansion, we did make improvements in the power factor from time to time by using synchronous motor drives for load additions. Our last addition was a 1000-hp, 0.8 lead pf refrigeration compressor motor. As this was the last likely large motor addition we could predict for some time, we turned to capacitors as the best possibility for future power factor correction.

Before going to capacitors we took into consideration the possibility of running some of the standby air compressors unloaded to try to make use of their corrective kva value. This was calculated at 570 to 665 kvar.

Calculated data seemed questionable so we ran field tests which showed that the cost of kwh energy was more costly than the peak savings. These units are reciprocating compressors and we could not risk running them uncoupled as they are on 24 hour standby duty. We also tried running some of our 700-hp, unity pf, centrifugal compressors with the fluid coupling dry. Due to exciter losses, auxiliary drive losses and extra maintenance this did not prove economical.

Having exhausted all methods of using existing equipment, we studied the use of conventional capacitors. Most plant engineers feel the cost of correcting the power factor above 94 to 95 per cent is not warranted. However we made a detailed report to management pointing out what was happening, showed the results of our tests to improve conditions, and recommended the installation of 1200 kvar in capacitors as a starter. Rate of return was figured at 59 per cent.

Fig. 5. Electrician uses a clamp-on indicating power factor meter to check power factor of motor at various loads.

Approval was granted to install 240 kvar as a test case. The best location for capacitors is directly at the motor since correction is realized all the way back through branches, feeders and mains. In an attempt to find the low power factor areas, we installed our recording power factor meters on the secondary side of several of our 500 kva, 480-v power transformers.

We found several of these with low power factor and then proceeded to check the larger motors in these systems with our hook-on power factor meter, Fig. 5. It soon became obvious that diversity was going to be a problem. It was difficult to find motors that would be on the line all the time. It was noticed that the power factor at the transformer was fairly constant so it was decided to install a unit of 120 kvar on each of two transformers.

Calculated savings in cost of purchased power for period from January 1957 to December 1957 if 2400 kvars of capacitors had been in operation in January 1957.

	Kw	Kva	Power Factor	Kvar	Kvar less 2400	New Power Factor	New Kva	New Billing Kva
Jan.	8,208	9,120	.90	3,976	1,576	.982	8,358	8,704*
Feb.	7,974	8,960	.89	4,086	1,686	.978	8,153	8,704*
Mar.	7,949	8,704*	.92	3,378	978	.992	8,013	8,704*
Apr.	9,500	10,000	.95	3,120	720	.997	9,528	9,528
May	9,642	10,480	.92	4,098	1,698	.985	9,789	9,789
June	10,528	11,200	.94	3,819	1,419	.991	10,623	10,623
July	10,083	10,960	.92	4,285	1,885	.983	10,257	10,257
Aug.	10,640	11,200	.95	3,494	1,094	.995	10,693	10,693
Sept.	10,829	11,520	.94	3,928	1,528	.990	10,938	10,938
Oct.	9,901	10,880	.91	4,515	2,115	.978	10,124	10,124
Nov.	10,046	11,040	.91	4,582	2,182	.977	10,282	10,282
Dec.	8,024	9,440	.85	5,270	2,870	.942	8,518	8,750
		123,504 Actual kva billed					New kva	117,096

Difference of 6,408 kva times $3.125 = $20,025 savings.

Note—*Minimum billing peak 80 per cent of 10,880 or 8,704 kva

Capacitor Costs

We obtained quotations on different units, analyzed the comparative costs of assembled units versus individual units put together by our own men and decided that the assembled units would be less costly in the long run and also more attractive from a safety viewpoint.

These units were purchased and

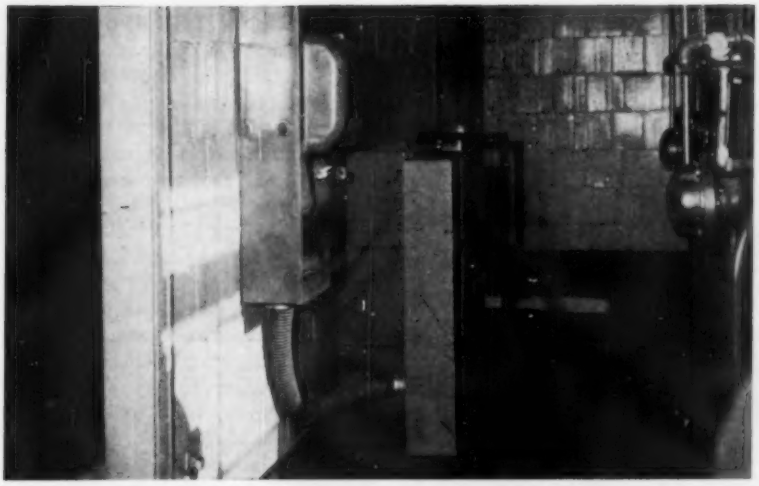


Fig. 6. Capacitors can be installed by the average electrician without any difficulty. Here is an installation in a transformer vault showing connection to the low voltage bus by means of a safety switch feeding the capacitor bank.

Fig. 7. Six capacitor units are banked together and connected to secondary switchgear bus through circuit breaker.

installed for a total cost of $2340 or a cost of $9.75 per kvar. Power factor at the transformers was raised from approximately 70 to 92 per cent with a savings of $300 per month, Fig. 6. A plus feature was the raise in voltage from 470 to 477 volts due to the addition of the 120 kvar unit to the secondary of the transformer.

With this actual savings demonstrated, management approved additional funds for more units. We installed two 90 kvar, two 120 kvar and three 180 kvar banks on other transformers, Fig. 7. Power factor was improved from 76 to 89 per cent on two units, from 71 to 98 per cent on two others and from 66 to 98 per cent on a fifth installation.

These installations, totaling 960 kvar, were made at a cost of $9180 or $9.56 per kvar. Billing peak reduction for all units combined was in the order of 480 kva with a value of approximately $1400 per month.

Our search for motors that were continuously running had proved successful by this time and funds were requested for an additional 235 kvars of capacitors to be connected at individual motors. In these installations the capacitors can be connected directly to the motor terminals so they are switched with the motor or connected to the line side of the starter so that they are on the line all the time.

We decided to tie the capacitors directly to the motor terminals where this was possible to save the cost of the disconnect switch usually required. Fuses, circuit breakers and overload relay sizes are all affected by capacitor installations. We found all the various vendors' data books equally helpful in determining corrections to these elements needed.

Correcting Motors

Our cost for installing these capacitors on motors was $3700 or $15.00 per kvar. They reduced our power bill approximately $2300 during the first year of operation. Six 9-kvar units were installed on 40-hp ventilation blowers, Fig. 8, two 11-kvar units were installed on 50-hp circulating water pump motors, Fig. 9, four 21-kvar units were installed on 100-hp pumps, Fig. 10, and two 37.5-kvar units were installed on 4160-v house pumps. Power factors were raised from 87 to 99 per cent in most cases.

Plant load had been increasing steadily all this time up to a peak of 11,520 kva so we took another look at further power factor correction. Another report was formulated with a recommendation to install 2400 kvar to bring us just under unity power factor at peak load. This installation was to be two banks of switched capacitors installed on our main 4160-v bus and was estimated to pay off in slightly over two years time.

Several points had to be considered in arriving at the correct amount of kvars to be added. While we were aiming at unity pf, there would be no advantage in going beyond that point. There is no provision in the billing structure for compensation for leading pf. Also, this may cause transients at light loads which can be harmful to large machines. Voltage can also be a problem depending upon whether the voltage is high or low before the addition of kvars is made.

Fig. 8. Connected directly to the motor, this 8 kva unit furnishes power factor correction to a 40-hp ventilation blower.

Again, we dug back into our records and the power company charts. Curves were plotted of kw, kva, and power factor over a typical month showing the variation that we would have to contend with both

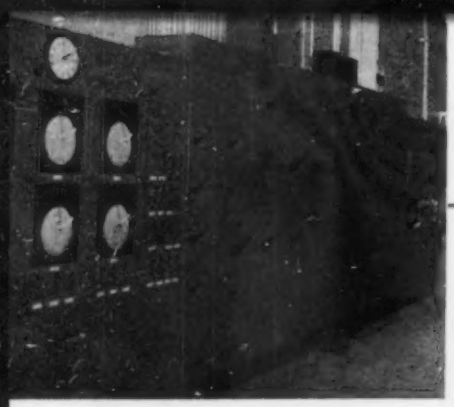
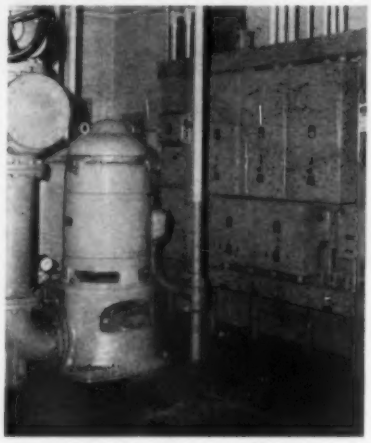


Fig. 9. Motor control center showing capacitors for 50-hp circulating water pumps mounted on top of the cubicle.

Fig. 10. Two 21 kvar units, mounted on top of the starter rack, correct two 100-hp cooling tower cold well pumps.



SQUEEZING POWER COSTS

day and night. Our plant is a one shift plant with only essential operations on an around the clock basis. This means quite a variation in load during any 24-hour period and consequently quite a variation in power factor.

We made a tabulation of the actual plant peaks over the period of the previous year and the power factor at the time of peak. We then selected the value of correction that would be needed to bring us just under unity. This meant that our power factor would vary from 94.2 to 99.7 during the course of the year at the time of peak demand.

It also meant, that at times we would be operating with a leading pf. As our incoming voltage was on the high side, we decided on switched units. We then plotted the time of our peaks for each day from past records and found that these generally occurred at 11:30 a.m. and 2:30 p.m. each day although some had occurred as early as 9:00 a.m. and as late as 4:00 p.m. This led us to the choice of load or current control to turn the units on or off so that they would only be on the line at the time of high load and probable peak.

Funds were requested and approved for $40,000 to install two banks of 1200 kvars on each of our two main 4160-volt bus systems. Fig. 1. Each bank has its own control panel and circuit breaker with one master control panel to operate both breakers. These units were put on the line resulting in a billing power factor of unity. The fact that our electric standby air compressors were operating no doubt made the difference between our calculations and the actual billing power factor.

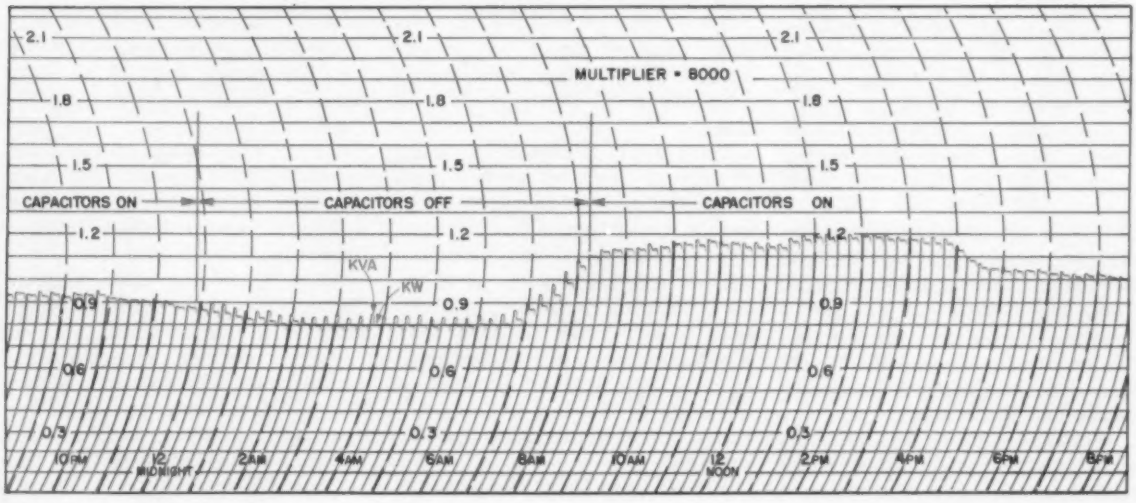
Power bill reduction was approximately $900 that first month. The next month pf was 98.4 per cent and the savings $2150. In the next month the saving was $1760 with a pf of 99 per cent. All indications are that the savings will be well in line with our calculations.

Our total investment over this period of time has been approximately $55,600 for a total of 3925 kvar of capacitors. We figure these units are saving us approximately $40,000 a year. The capacitors together with our 0.8 lead and unity pf machines will keep the plant close to unity power factor at all times, Fig. 11.

It is obvious that the greatest benefits derived from these capacitors are at the lower power factor levels as evidenced by our August bill. Here the 2400 kvars raised the power factor from 97.4 to unity with a resultant savings of only $900. In September, these same units raised the power factor from 92.2 to 98.4 per cent with a resultant saving of $2150.

Our prime interest in making these capacitor installations was for power bill reduction. Not to be overlooked however, is that fact that loading on transformers and feeders has been reduced. This in itself is a bonus as it has delayed expenditures for additional capacity.

Fig. 11. Chart showing difference in kw, kva ratio when 2400 kvars of capacitors on main bus are switched on and off.



Here Is Basic Industrial Capacitor Information—Yours Free

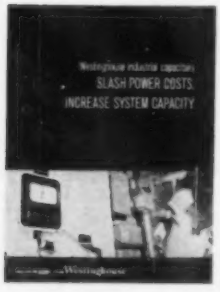
The Why, Where, and How of Industrial Capacitor Applications

How to use capacitors to reduce power costs, release system capacity, improve voltage levels and reduce power losses is the subject of a 12-pp bulletin offered by the General Electric Company. Other subjects covered are: How high do you raise power factor? How many capacitors do you need?, Where should you apply capacitors?, How to switch capacitors with the load, How to switch capacitors separately, How to use capacitors to reduce power costs, How capacitors work, and How to gain system capacity.

Free Slide Rule Calculator Helps Solve Power Factor Problems

Sprague Electric Company will send you a free circular slide rule type calculator to help you figure out the correct size capacitor to use. In addition, their two page bulletin is a guide for application and installation of low voltage industrial capacitors. Tables list kvar, rated amperes, wire size, fuse amperes, and switch sizes for individual and rack type capacitors operating on single, two and three phases and 240, 480, and 600 volt services. Wiring diagrams are included along with information on installations.

Capacitors Slash Power Costs, Increase Industrial System Capacity



Six major ways your power system can benefit from installation of capacitors is outlined in a 12-pp bulletin published by Westinghouse Electric Corporation. A nomograph chart is included to help you select and apply capacitors accurately and economically. As proof of capacitor value, several case studies are included to show return on investment and reduced electrical system load. Other sections give detailed information on where to install capacitors, selection of switches and breakers, and what power factor is.

Industrial System Power Factor Improvement Charts

Design, performance and rating of industrial capacitors is included in an 80-pp catalog covering the products of the Electric Utilities Company. Gives comprehensive data on how capacitors are made and the components that are used to achieve long life. Table gives relationship between capacitors and various other circuit components for both alternating and direct current. Alignment charts solve problems involving series capacitance, amperes vs. mfd, kvar vs. mfd, and solving industrial power factor problems.

Capacitors Are an Investment In Greater Productivity

Capacitors are designed to improve power factor in plants where the use of heavy inductive loads such as induction motors, transformers, welders and similar equipment create low power factor. Such conditions cause overloading of lines, low voltage, reduced production due to insufficient revolutions per minute of motors and increased electric power costs. Two page bulletin offered by Cornell-Dubilier Division, Federal Pacific Electric Company tells how these conditions can be overcome with a small investment.

Use this coupon to request your FREE COPIES of these data books.

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Roar Is Tamed in Cells
ENGINE DECIBELS GET TRIMMING

TWO JET ENGINE test cells which United Air Lines operates at San Francisco employ the latest in sound-control systems and combine the best features of military and commercial engine-testing techniques.

The test cells are made of concrete and each is 106 ft long and 36 ft high. They are joined by a control room containing a console which receives information transmitted from engines under test. The hookup between the engines and the console is coventional. In some of the critical lines a pressure transmitter prevents fluid from backing into the console if failure occurs.

Fuel for the engines under test is supplied by two 25,000-gallon tanks located behind the test cells. Kerosene is piped into the tanks from the bulk plant in South San Francisco. The fuel is transferred from the tanks to the test cells by a positive displacement pump which feeds through filters and flow control devices.

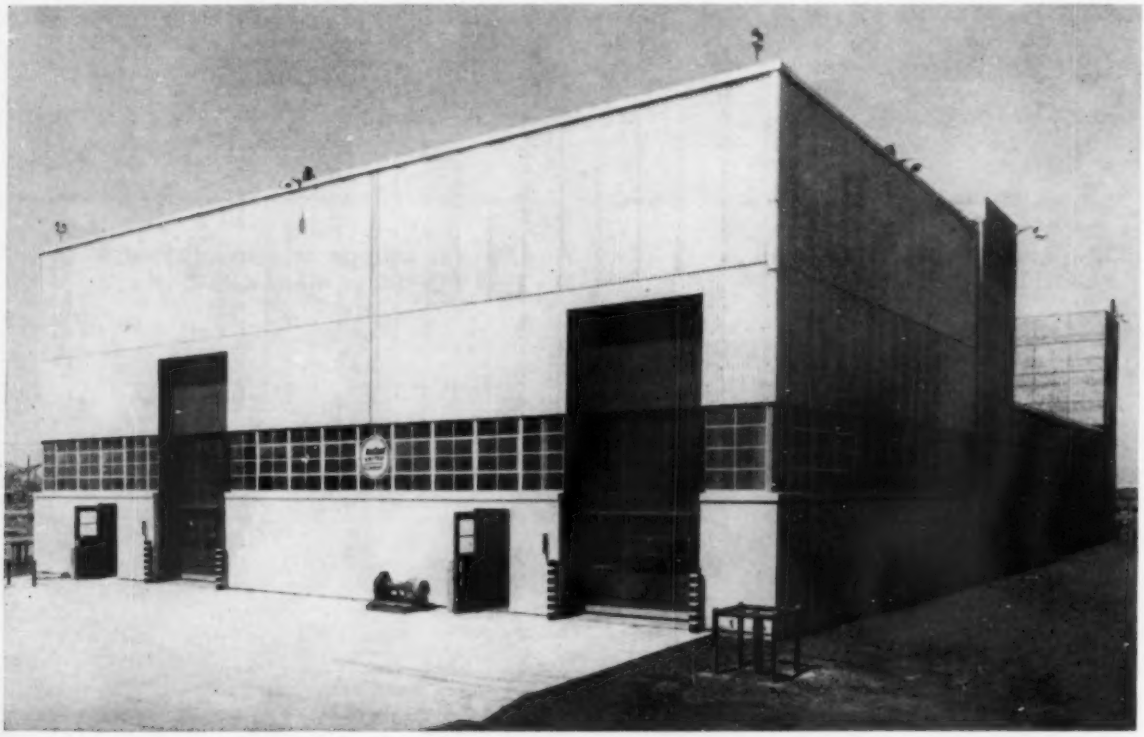
A variety of safety measures is installed in the test cells to prevent fire and other mishaps. The electrical equipment conforms with the standard Underwriters Laboratories' code requiring explosion-proof wiring. All junctions, terminals and other connections capable of sparking are housed in boxes so that in the event of fuel spillage no flash fires or explosions will follow.

United's standard procedure in operating the test cells requires the floors to be flushed thoroughly before starting an engine. This is accomplished by a manually-controlled system which sprays water over the concrete surface. The system also is used to wash away fuel and any other undesirable material from the cell floor.

Each test cell has 22 overhead sprinklers which can deluge the interior in a matter of moments. The sprinklers are triggered by a rate-of-temperature-rise detector. A rise of more than 10 deg within two minutes automatically sets off the sprinklers.

The mounts from which the jet engines hang have eight fog nozzles —four at the engine front and four at the rear. In event of fire, the nozzles are turned on by an operator in the control room.

Fig. 1. Concrete intake and exhaust ducts are at the back of the curtain-walled portion of engine test cell complex.



While undergoing tests, the jet engines are mounted in an underslung position which corresponds with their installation on the aircraft. See Fig. 2. The overhead mount has an air-driven lift which raises the engine from the transport cart into the mounting position. The same lift is used in removing engines when the tests are completed.

Jet engines have a normal tendency to "kick up" their nose when the thrust setting is increased. To compensate for this action ordinary engine mounts have an anti-kick bar. United's mount, however, is calibrated so that compensation is unnecessary.

Sound Level Reduction

The test cells have the latest in sound-control material and equipment. These measures are so effective that the sound which otherwise would swell to a shattering 155 decibels is reduced to 80 decibels—a level which the average person encounters daily without discomfort. In addition, sounds are controlled to prevent any vibrational effects on the engines.

The front door of each cell is a foot thick and has no metal-to-metal seal. An acoustic labyrinth within the door dissipates sound waves by routing them between layers of insulation.

The sound control system includes a series of diffusers, special Soundmetal acoustical panels, augmenter tubes, and patented Soundstream units. The latter employ three sound-suppression principles, working simultaneously, to muffle the low, middle and high frequency ranges.

Approximately 1500 sq ft of acoustic panels, along with another type of panels and diffuser grids, serve to break up low frequency sounds in the augmenter tubes of each cell. The intake chimneys, drawing in 900 lb of air per minute, have splitter panels. Curved forms attenuate the sound of hot gases passing through the exhaust chimneys.

The sound control system is so effective that United's engineers in the control room within 10 ft of engines in full operation are able to talk in normal tones. **End**

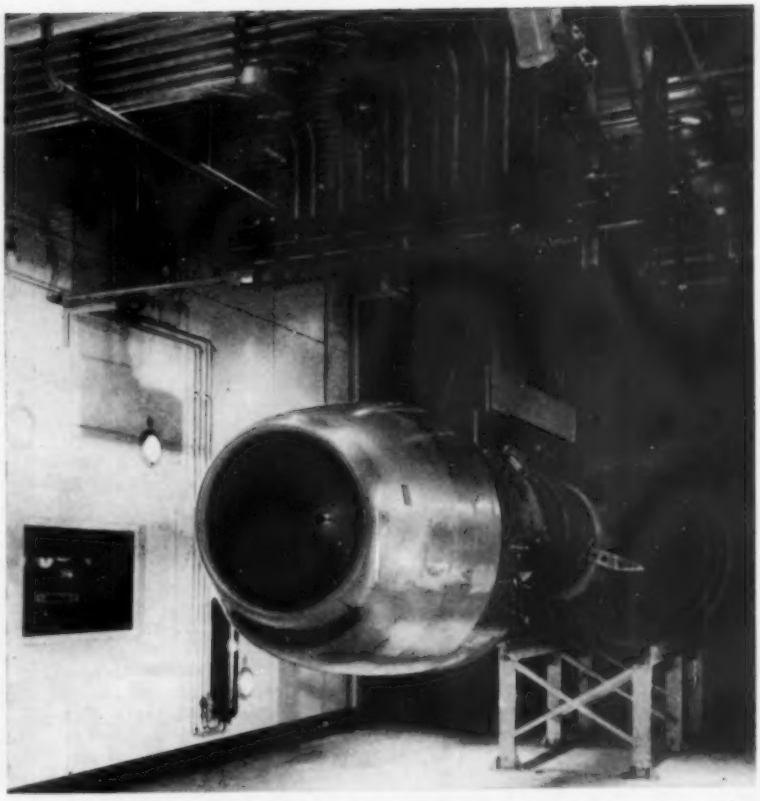


Fig. 2. Multi-ring sound suppressor is at the entrance to the augmenter tube.

Fig. 3. Engine blast continues past steel grids and through contoured ports.

Bearing Assembly Gets Boost from CORRELATED HANDLING

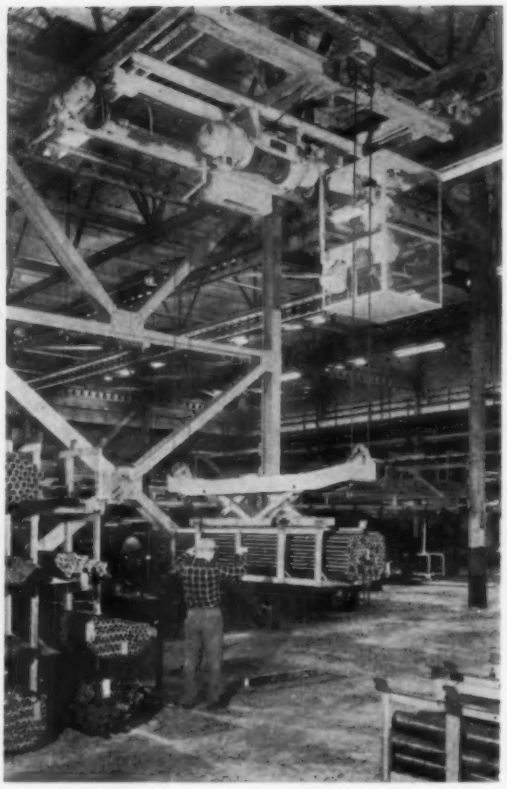
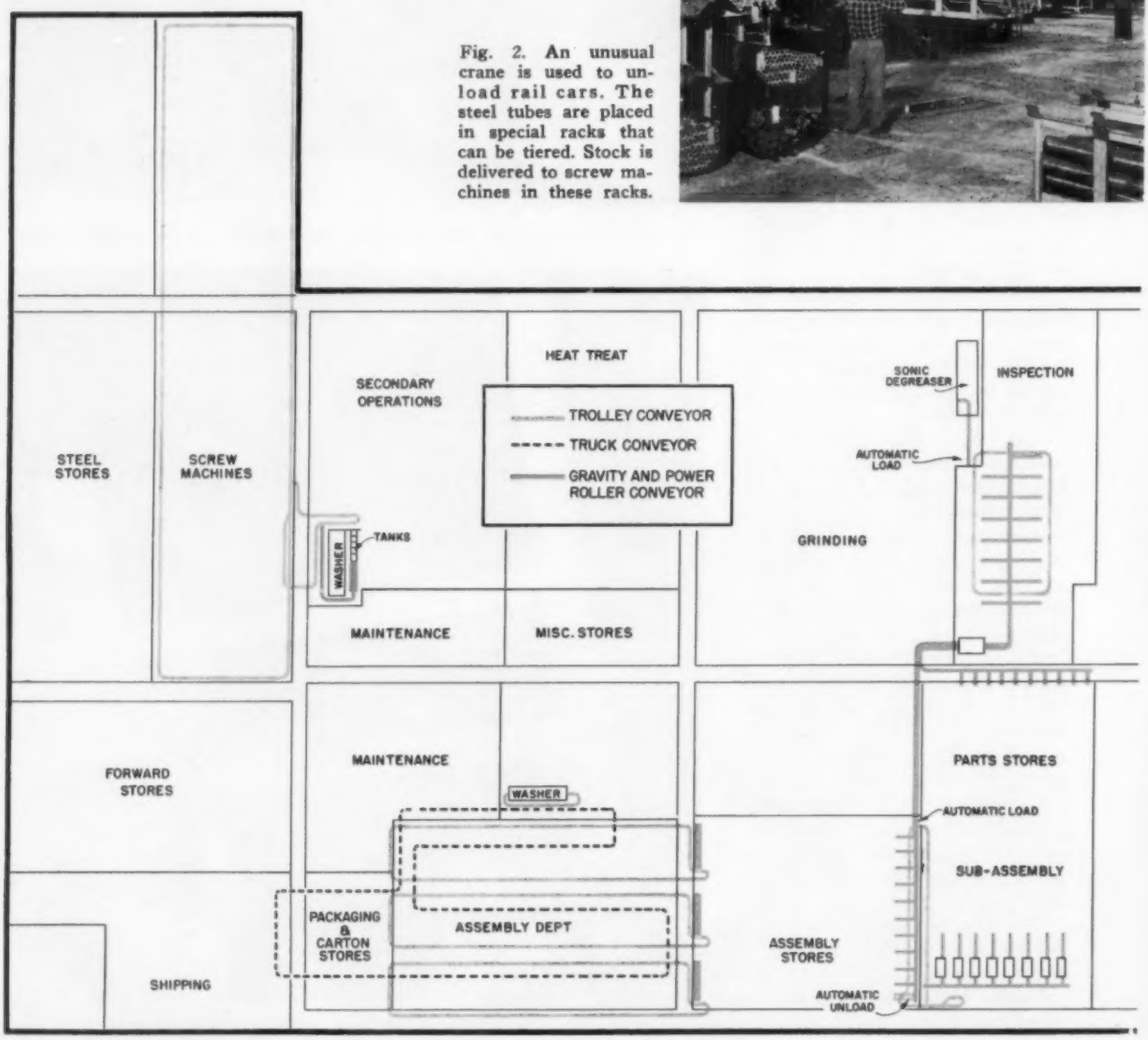


Fig. 2. An unusual crane is used to unload rail cars. The steel tubes are placed in special racks that can be tiered. Stock is delivered to screw machines in these racks.



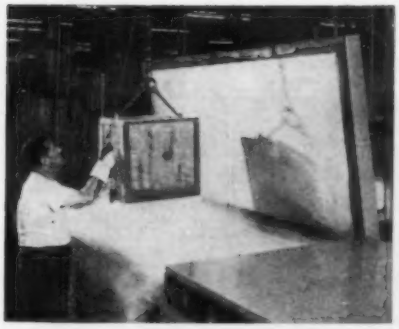


Fig. 3. For dimensional stability bearing parts are deep frozen to —120 F.

Fig. 4. Trolley and roller conveyors handle parts in the inspection area.

Fig. 5. After inspection and weighing baskets go up on a transfer-elevator.

WIDE USE of their own materials handling products has contributed to the over-all efficiency of Link-Belt's bearing manufacturing facilities. Cost-reducing handling equipment moves raw materials, components in process and inspection, and components and subassemblies in and out of storage to assembly and shipping.

Seven overhead trolley conveyors, an in-the-floor Trukveyor which tows four-wheeled industrial trucks, and a series of powered and gravity roller conveyors keep parts moving through the various stages of manufacturing in the Indianapolis plant.

Of principal note is the successful use of overhead trolley conveyors in conjunction with powered roller conveyors and the automatic transferring of tote basket loads of process parts from one type conveyor to another. Automatic selection of the pin-coded baskets to predetermined areas for discharge to a special conveyorized electric outrigger truck and then to selective storage is also of prime importance.

Primary materials handling of all steel material to the completion of the first machining operation is accomplished by use of a 7½-ton underhung double girder, three-runway crane system. Color-coded seamless steel tube and bar stock used in the manufacture of bearing components are stored in self-nesting racks which disengage automatically when lifted by the crane.

This unique overhead crane unloads steel stock from rail cars and trucks, and stacks it in tiered racks which are lifted and transferred by a switching arrangement to an adjacent bay, 180 ft long by 80 ft wide. See Fig. 2. This bay houses a battery of multiple spindle automatic screw machines. The crane spots the loaded rack beside the screw machine, so that the operator can withdraw stock as needed during a production run. Heavy stock is loaded into screw machines with the aid of jib cranes.

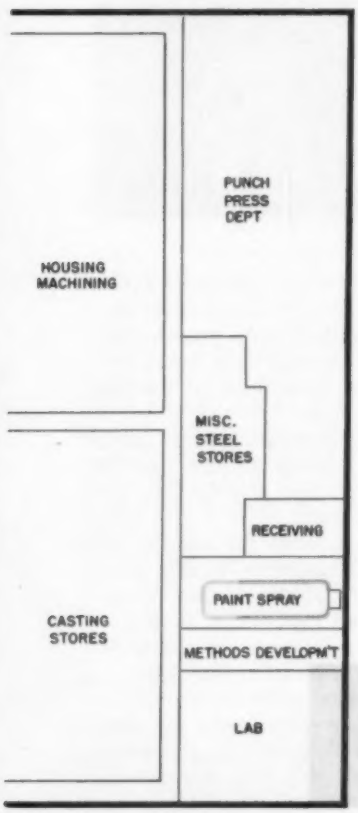


Fig. 1. Interdependent conveyor systems along with other handling equipment move the parts in process toward final assembly.

Screw machine parts are collected in wire baskets and placed on a trolley conveyor which goes past this machine department. The baskets pass to an automatic unloading mechanism which transfers the wire baskets of parts onto a roller conveyor and through a two-stage washer. Parts are then transferred to bulk containers.

The bulk containers of components are moved to the secondary operations and the heat-treating department. Components are fed onto Syntron vibrating feeders that feed the atmosphere-controlled, continuous hardening and draw furnaces. To provide dimensional stability in the finished inner and outer rings of the bearing, parts undergo a deep freeze process. See Fig. 3.

After heat-treating and deep-freezing, the parts are collected in bulk containers and moved into the grinding department. Following the first grinding operations, the process containers are changed to special pin-coded tote baskets designed for selective conveyor handling.

Stacked tote baskets of components are moved within the grinding department on fitted castered bases. With the completion of grinding, the components in the tote baskets are placed on a special chain conveyor which moves the parts through a degreaser and oil bath.

This temperature-controlled oil bath coats the parts with a protective oil film and, most importantly, reduces the temperature of parts so they coincide with the temperature of the inspection area where they are conveyed.

Baskets enter the inspection room

Fig. 6. An elevating outrigger truck works between rows of sloping racks in sub-assembly parts area.

Fig. 7. Truck's conveyors are in effect extensions of each of the overhead conveyor stubs; operator has good control location.

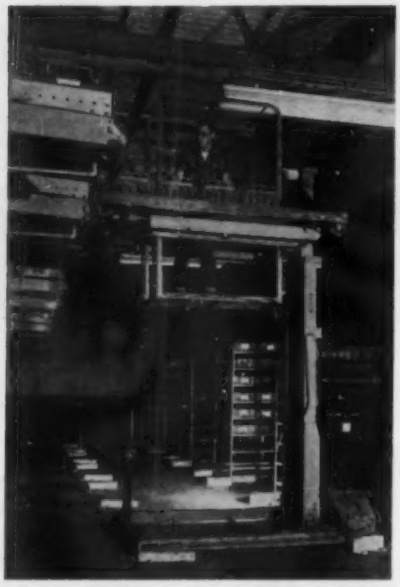


Fig. 8. In-the-floor conveyor pulls trucks with sub-assembled components past final assembly lines.

CORRELATED HANDLING

on a powered and gravity roller conveyor and are automatically transferred onto a trolley conveyor circulating the area. The tote baskets of components are removed from the trolley conveyor on demand by the inspectors. See Fig. 4.

When the contents of the baskets have been inspected, they are moved onto a powered roller conveyor running the entire length of the inspection room; they pass through a double-dip station for removal of fingerprints and for a protective coating, then pass to the dispatch area for weigh counts. See Fig. 5.

The dispatcher codes the tote baskets for remote dispatching by setting a pin in any one of ten slots on the front of the tote basket. The baskets are sent to the finished parts stores and by means of the upward projecting coding pin, are automatically ejected by switches to any one of 10 discharge stations, 10 ft above floor level. The baskets are removed from these conveyors by an electric outrigger truck and delivered to the proper storage rack.

Tote baskets of components are removed from the storage racks by the same truck and delivered to the sub-assembly lines. Continuous washers at the end of each sub-assembly line clean the finished sub-assemblies.

Sub-assemblies are then inspected, loaded into baskets which are again pin-coded, and by means of a powered roller conveyor are sent to a pickup station. Here the baskets are removed by an overhead trolley conveyor which carries the parts thru a preservative dip and on into the sub-assembly store room.

Once inside the store room, baskets of sub-assemblies are automatically discharged from the trolley conveyor to a powered roller conveyor and sent to the pre-determined station, as indicated by the pin setting, in the sub-assembly store room.

An outrigger truck, removes the baskets of sub-assemblies from one of 10 discharge conveyors and places them in the proper rack location. See Fig. 7. In sub-assembly stores the baskets are removed from the first-in, first-out inclined storage racks as required by the Final Assembly Department.

The outrigger truck is used to remove the baskets of sub-assemblies from the racks and deliver them to the outgoing powered roller conveyors which in turn, automatically discharge them to three trolley conveyors for distribution to the final assembly lines.

An in-the-floor system moves trucks of bearing housings from the housing storage area to the nine assembly lines.

On these lines the housing and bearing sub-assemblies are assembled into pillow blocks, flanged blocks, cartridge blocks, flange cartridge blocks, take-up blocks, trolley assemblies and other mountings.

Assembled units are then placed on the Trukveyor trucks and transported to the packaging department. After packaging, the same system is used for delivery to final stores. **End**

Should You AIR CONDITION?

Three-Step Approach Helps Provide Answer:

1. Make a plant survey

2. Study available systems

3. Examine application techniques

By **ERNEST C. HUNGATE, Manager, Industrial Air Conditioning, Carrier Corporation, Syracuse, N. Y.**

FINDING THE right answer to the question about air conditioning your plant can be approached in a haphazard manner or it can be methodical. The former decision can result in a lot of headaches later on; the latter, a system which you will be proud of and which will offer many years of service.

Here are the three steps of a systematic program which will provide you with the necessary evidence on which to base a decision about air conditioning part or all of your plant: (1) make a plant survey to determine your specific needs; (2) study the various air conditioning systems available to find out which one fits these needs; and (3) examine the different application techniques so that you will get the best system for your plant.

Plant Survey

The first step is to have a survey made of the entire plant. Professional assistance is advisable because plants are among the most complicated buildings to air condition and require more theoretical and practical experience than installations in other types of buildings.

A typical recommendation will be that either: (1) the entire plant should be air conditioned (probably by various systems or equipment); or (2) only areas which have or will have sufficient worker density to justify installation should be considered.

The analyst will then evaluate each production area from the following standpoints: (1) type of system required, (2) initial system cost, (3) operating cost, (4) benefits, and (5) return on investment. Such a survey by experienced air conditioning engineers can usually be made without obligation.

A system specified in this manner is your first indication of future profits. Detailed evaluation of each point will provide the information upon which realistic decisions can be based.

Depending upon the equipment selected, length of service can vary from 5 to 30 years. An evaluation of operating and maintenance costs for each type of apparatus will help determine which system best suits the need. One note of caution: do not let low initial cost be the sole factor on which a decision is based. It can easily be more expensive in the long run.

COOL AIR SUPPLIED FROM ABOVE OR BELOW

Individual worker is cooled by direct supply of low-velocity dehumidified or evaporatively cooled air. Worker can adjust air direction by means of flexible nozzles; air quantity, by dampers.

It is impossible to predict the exact degree of improvement before installation. However, any air conditioning system specified for a

particular area should be expected to increase productivity at least one-half of one per cent to two per cent and thus cover cost of the system, its operation and upkeep. Otherwise, the analysis would prove it should not be conditioned, at least by the method originally planned.

Types of Systems

Refrigeration machinery supplying cooling for any year-round system consists of three types: reciprocating, centrifugal and absorption.

Small to medium installations (100 to 150 tons cooling capacity), most commonly use water chillers with a reciprocating compressor, although many use centrifugal machines. Jobs of larger capacity on the other hand generally favor chillers of the centrifugal compression or the chemical absorption type instead of a number of reciprocating units. Primary reasons are economy of operation, lower maintenance and less floor space.

Centrifugal chillers are available in capacity from 90 tons to 5000 tons. These are recommended where electric power rates are low, and where space-saving, low maintenance and long, dependable life are important. They may also be driven by steam turbines and the availability of steam at low cost may dictate this type of drive. Gas engine drive may be another choice under certain conditions.

Absorption refrigerating machines use heat to produce cold water. Water sprayed into a vacuum vaporizes and is absorbed by a salt solution. The strength of the absorbent is maintained by continuously boiling off excess water vapor. This is the newest commercial means of producing a cooling effect, yet it involves the oldest known chilling process. Steam, hot water or any hot fluid can be used to constantly regenerate the cycle. Made in sizes providing up to 750 tons of cooling capacity, absorption units have particular application where boilers are only partially loaded in summer. In cases where there is waste heat from manufacturing processes, operating costs approach zero.

Air Handling Units

Supplementing the refrigeration machines are three main types of apparatus for conditioning and distributing the air through the plant, although the variety of such equipment is virtually limitless.

1. A single room, such as a small production area or laboratory, can be air conditioned by packaged units in which cooling, heating, filtering and circulating components make up a single air treating assembly. Ductwork can be attached to distribute air to plant areas, or the unit can discharge its air directly into the area it serves.

These self-contained conditioners are ready to operate when connected to electric power and water lines. For best results, outside air should be mixed with room air. The unit should therefore be located next to an outside wall whenever possible for installation economy.

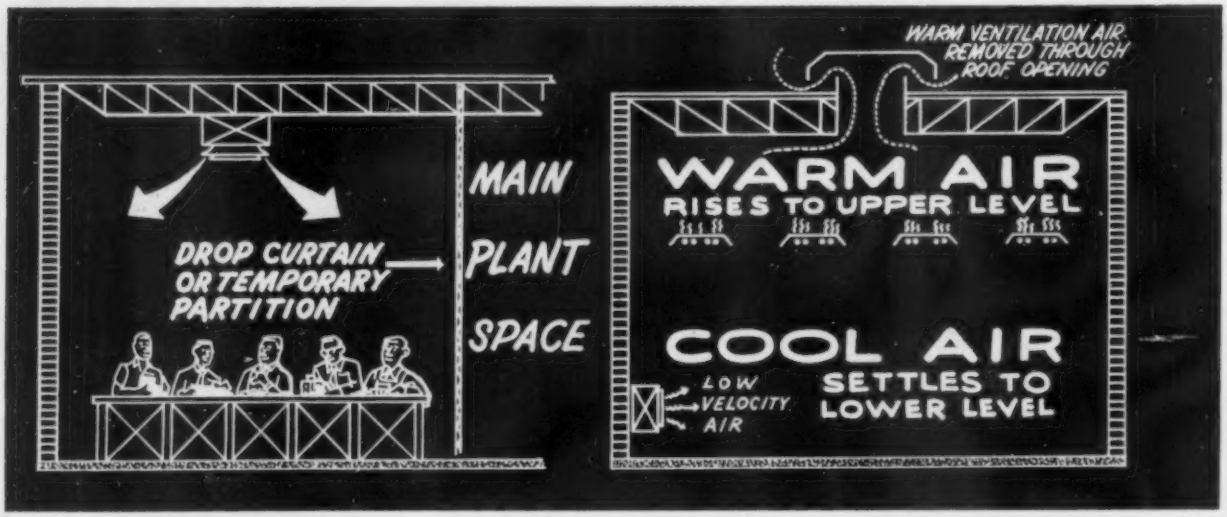
Packaged units have simple controls. Their entire front panel is removable for servicing and they are easily relocated. They do, however, occupy vital floor space.

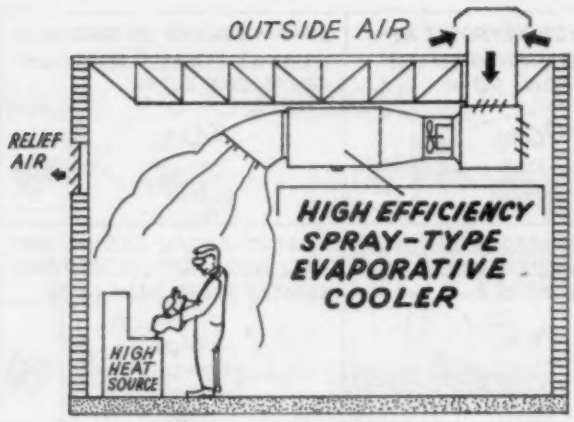
2. Bigger areas are generally handled by conditioners known as central station units made up of individual sections housing fans, coils, filters and an outside-return air mixing chamber. Warm or chilled water is supplied to coils from remote sources. Central station units are versatile and can be installed in any arrangement like toy building blocks. However, they are usually suspended from the ceiling. They distribute conditioned air at either high or low velocity. One type of unit can meet simultaneously demands for different climatic conditions in 14 different spaces.

3. The newest air handling unit now available was designed especially for industrial use. Air contaminated with dust, dirt or lint particles is effectively "washed" by spray water. There are no coils or

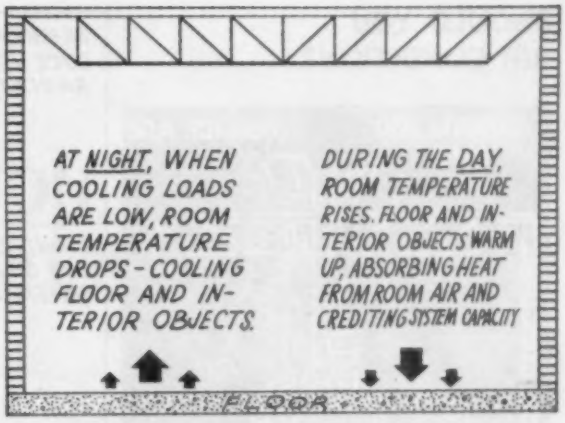
In large areas with few workers, regroupings of operations and using partitions make worker comfort practical.

Low level cooling—much of the heat from the roof, upper walls and the lights never reaches the cool area below.


DROP CURTAIN OR TEMPORARY PARTITION
MAIN PLANT SPACE
WARM VENTILATION AIR REMOVED THROUGH ROOF OPENING
WARM AIR RISES TO UPPER LEVEL
COOL AIR SETTLES TO LOWER LEVEL
LOW VELOCITY AIR



High heat areas can be economically handled by outside air, cooled by water evaporation and supplied at low velocity.


AT NIGHT, WHEN COOLING LOADS ARE LOW, ROOM TEMPERATURE DROPS - COOLING FLOOR AND INTERIOR OBJECTS.
DURING THE DAY, ROOM TEMPERATURE RISES. FLOOR AND INTERIOR OBJECTS WARM UP, ABSORBING HEAT FROM ROOM AIR AND CREDITING SYSTEM CAPACITY
FLOOR

Thermal storage allows a lower capacity air conditioning system to be installed by leveling out cooling load peaks.

filters to become restricted, thus losing heat transfer or cleansing efficiency. The cylindrical unit made of stainless steel flushes itself continuously when in operation. Foreign matter removed from the air is separated from recirculated cooling water by an automatic strainer located at a central pumping point.

Occupying one-third the space of conventional apparatus, models of this aerodynamically-shaped conditioner are light enough to be suspended from the ceiling, hung from a wall or placed on a roof. A combination of outside and return air, drawn in by the unit's axial-flow fan, is pushed through a "hurricane" of water sprayed from a series of non-clogging nozzles.

The air movement also turns a rotating eliminator wheel separating spray water from conditioned air. The clean, cool air is then distributed by ducts to plant areas. A humidistat and thermostat can be set at the exact humidity and temperature desired, and these conditions are automatically maintained at these precise valves at all times.

The foregoing equipment can also be used with non-refrigerated water to provide limited cooling by evaporation. For example, outdoor air at 95 F dry bulb and 78 degrees wet bulb—a typical upper design limit —can be cooled to 79 F by passing outside air through recirculated spray water. Heat is absorbed by the evaporation of water.

As the temperature on most summer days will be below 95 F, plants are benefitting from this type of system. Humidity can be held constant, however, and temperature can be brought under full year-round control by addition of refrigeration.

These are the "tools" for air conditioning plant spaces. Now, how are they applied?

Nearly all plant air conditioning falls into three broad groups: individual, area or complete conditioning. One system may be all that a plant will use. But more likely, all three system types will be needed to handle various plant requirements.

Spot Cooling

Another name for "individual" conditioning is spot cooling, used for economic reasons where heat loads are high or in large areas where it is impractical to condition the entire space for only a few people. The individual worker or the spot in which he is working is the area of relief.

A single conditioning unit, with or without ducts serving one or more areas, can do the job. Care must be taken to avoid drafts. Spot cooling is probably the most mis-applied method of air conditioning and requires experience to establish the proper temperature, velocity, quantity and direction of supply air. A poorly designed system can be intolerable to workers, yet done correctly it can be an effective, and inexpensive asset.

Spot cooling is especially beneficial where fumes contaminate the air. In such cases, outdoor air is brought in, cooled, and dehumidified, and distributed at low velocity in the vicinity of the worker's breathing zone.

This provides dual advantages—pure air for breathing as well as relief from surrounding heat. When carefully handled, it can eliminate the need for an exhaust arrangement.

Some examples where spot cooling is the most practical remedy for what might otherwise be an intolerable situation are crane cabs in steel mills, textile plants, laundries and production of drills for oil rigs.

Area conditioning refers to positions occupied by a group of workers large enough to justify air conditioning. A partial enclosure by means of canvas drops or semi-partitions can often help reduce operating costs. Workers isolated from the main assemblage could be served by a spot system.

Where there are a large number of occupants assembling small parts such as watches, cameras, cigarette lighters, electric razors and sub-assemblies for electronic computers, it is more practical to air condition the entire room or plant. A complete system is almost always justified when worker concentration is less than one worker for every 300 sq ft of floor space. Internal heat gain may be relatively low, but because of plant size, large capacity equipment is often required.

Application Techniques

Unlike office buildings which are quite similar and often less complex to air condition, plant interiors differ as widely as the industries they serve and each presents its special problems.

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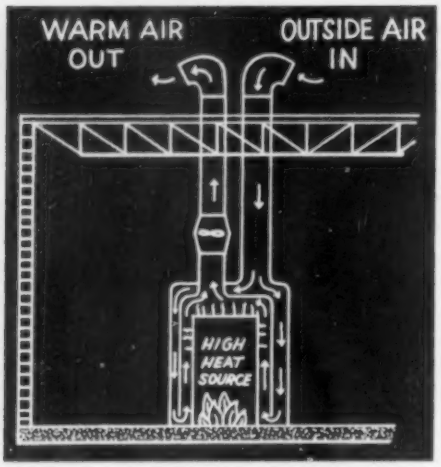
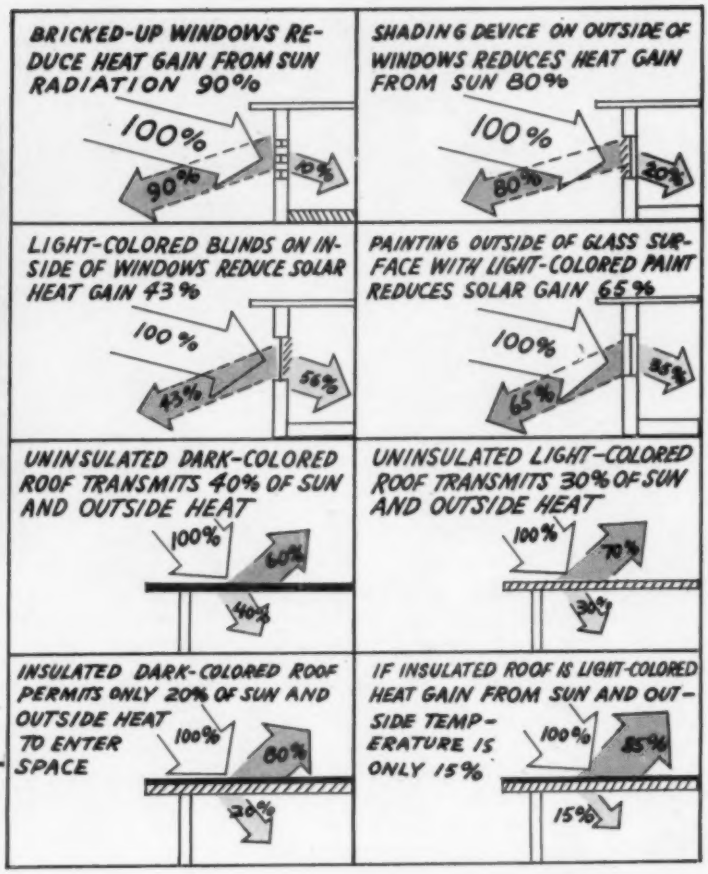
SHOULD YOU AIR CONDITION?



Double-shielding plus direct supply of outside air makes working next to very high heat source possible by (1) shielding both worker and space from radiation, (2) capturing and removing convective heat before it enters the room, and (3) reducing the quantity of outside air that must be brought in.



Building heat gains and air conditioning costs can be reduced considerably by the proper treatment to roof and window areas.

Air Stratification—Condition only areas below the 8 to 10 ft level. This procedure can cut refrigeration tonnage as much as 50 per cent. As high ceilings are peculiar to plants, separation of conditioned from nonconditioned areas is achieved by introducing air horizontally at a low level. The air should be moved gently around the workers and not directed at their heads, backs or shoulders.

Thermal Storage—Turn the system on before start of the shift and leave it on after the shift goes home. The building itself, machinery and furniture become reservoirs of cooling or heating, whichever is being sent into the space. During regular working hours, the stored cooling effect will help maintain the desired atmospheric condition, reducing system capacity and thereby the initial cost.

For example, storage capacity of a concrete floor, 100-ft square and six inches thick, is alone sufficient to reduce installed refrigeration capacity 12 per cent.

Hot Spots—These are critical areas that demand attention to restrict dissipation of heat throughout the plant. For instance, even though a smelting furnace is insulated, large quantities of heat escape into the surrounding atmosphere: Two things are generally done: more insulation is added and an exhaust hood installed.

But, there is a limit to practical insulation thickness, and radiant heat from the surface of the furnace cannot be entirely captured by hooding. Furthermore, air which is to be exhausted must be brought in from outside and cooled and dehumidified, increasing system-owning and operating costs.

A practical way to save this expense involves shielding workmen from the furnace by surrounding it with a double sheet metal wall. As air between the wall next to the furnace and the "hot box" is warm, it will rise. By means of a fan, this warm air can be removed from the building.

Concurrently, outdoor air can be brought in, passed down between the sheet metal walls and under the center partition to replace that air which has just been exhausted. Thus, convected heat is removed with recirculated outside air, radiant heat is contained by shields and the air conditioning system is not penalized by having to cool outside air for the enclosed space.

Some other design and application suggestions are:

1. Brick-up, or shade, windows to reduce heat gain.
2. Shade east and west sides with trees where possible.
3. Properly insulate the roof.
4. Coat roof with light colored paint or gravel to minimize solar effect.

In summary, a comprehensive plant survey will indicate where management is losing money and at what rate due to lack of atmospheric control. If the budget permits, air condition all areas where systems can profitably be installed. Maximum savings accrue from purchasing a complete job and thereby obtaining the lowest cost per ton of refrigeration or lowest cost per cubic foot of cooled air. **End**

How To Calculate

INSULATION FOR UNDERGROUND LINES

By WALTER LOVETT, Manager, Technical Service Dept., Pittsburgh Corning Corporation, Pittsburgh, Pa.

THERMAL INSULATION for underground pipelines must serve two separate but equally important functions: It must restrict, to an economic level, heat transfer into or from the fluid being transported; and it must protect the pipeline against corrosion due to ground water and differential soil potentials.

To carry out the latter function, the insulation not only must be non-corrosive to the pipe, it must be impervious to moisture penetration. The first requirement alone is relatively easy to satisfy with the thermal insulations available today. Sealing against corroding ground moisture, however, is a more difficult assignment if installation cost is to be kept to a reasonable level. It also imposes certain restrictions on the selection of the insulating material. An insulation of low compressive strength or one with high moisture absorption requires a more costly waterproofing system than one which is structurally strong and impervious to moisture penetration.

To obtain these fundamental requirements, we must consider them in relation to the proposed underground environment. In general, underground piping operates at a temperature significantly different (either hotter or colder) than the surrounding earth. Also of considerable importance is the fact that the surrounding earth contributes an insulating effect on the pipeline, especially when the line is buried deeper than one foot and the soil is not water filled.

In some cases very little additional insulation is needed to reduce heat transfer to an economically acceptable value. Studies made at the University of Minnesota and published by M. S. Kersten, show that soil thermal conductivities vary from 3 Btu/hr/sq ft/°F/in. for nearly dry silt soils, to 24 Btu/hr/sq ft/°F/in. for water-saturated, compacted quartz sands.

This broad range in values makes it difficult to choose any single insulation conductivity for performance evaluation unless it is correlated to the line temperature. For instance, the moist soil immediately around a heated pipe will normally be fairly dry and this drier soil will constitute the major portion of the

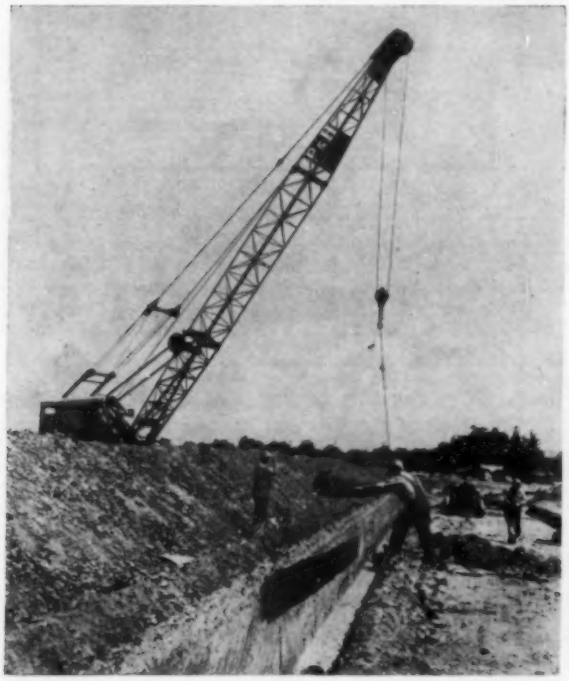


Fig. 1. Sections of pipe, insulated above ground, were welded together then lowered on to a 6-in. bed of compacted sand.

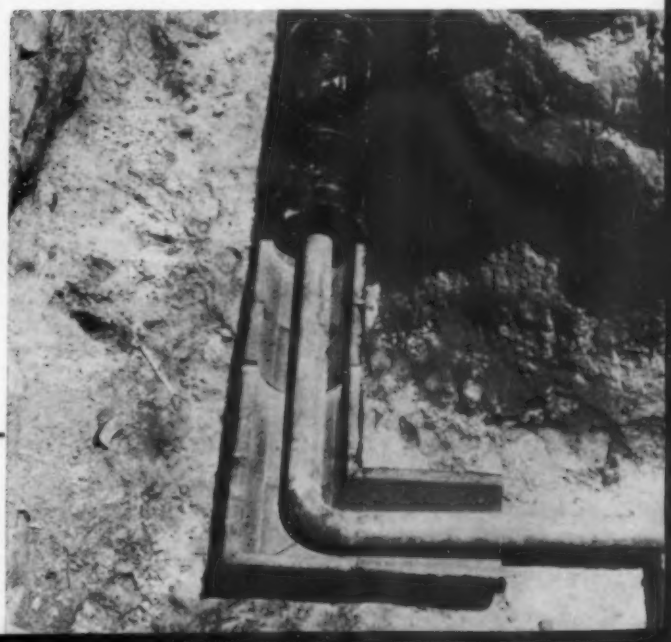


Fig. 2. Insulation of 90-deg pipe ells. Blocks support the pipe to allow installation of bottom half of pipe covering.

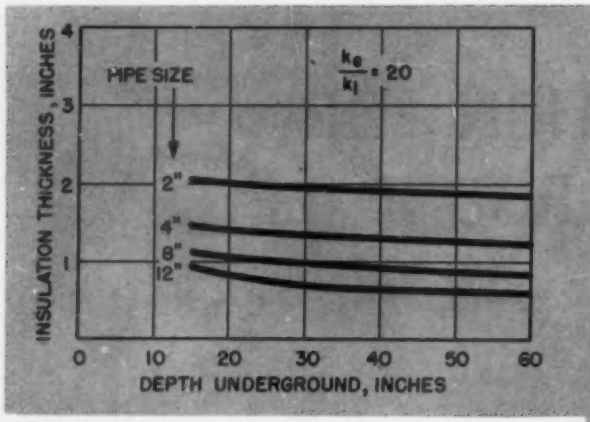


Fig. 3. Insulation needed for 75 F air temperature on 300 F buried pipe in soil with relatively high thermal conductivity.

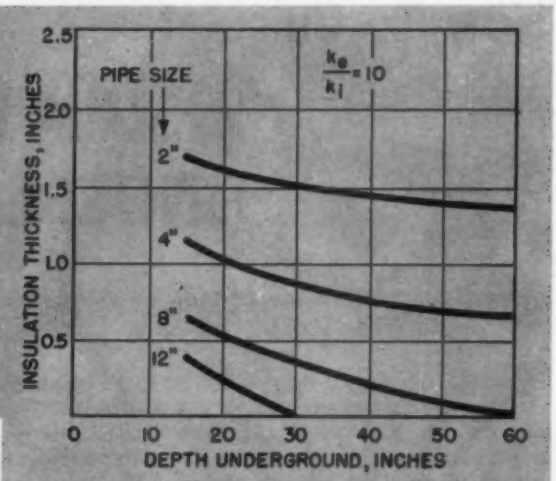


Fig. 4. Insulation needed for 75 F air temperature on 300 F pipe in soil with low thermal conductivity.

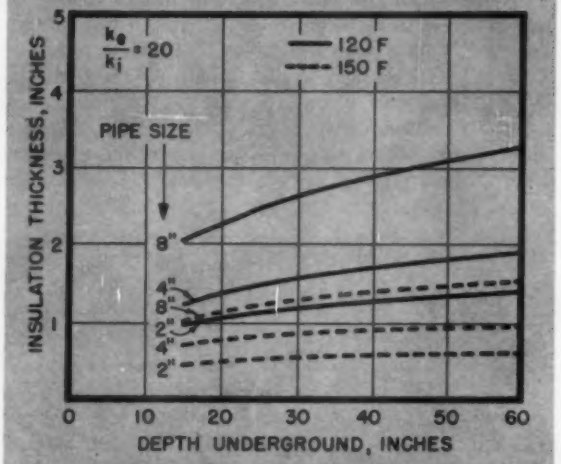


Fig. 5. Insulation thickness required for 75 F air temperature on 300 F pipe buried in soil with relatively high thermal conductivity in order to prevent the insulation surface temperature from exceeding 150 F.

soil's thermal resistance. Therefore, reasonable choices from Kersten's data are 4 to 5 Btu/hr/sq ft/°F/in. for lower conductivity soils and 8 to 10 for higher conductivity soils.

These conductivity values are considerably higher than the 0.4 to 0.5 typical of the K values for hot line insulations, but the studies prove that soils do have an insulating effect. Consequently, values of 10 to 20 for the ratio of soil thermal conductivity (K_e) to the thermal conductivity of the insulating material (K_i) covers most of the usual applications.

Common practice in specifying insulation thickness is to limit the heat loss to 10 per cent of that from an uninsulated horizontal pipe exposed to air. This is commonly referred to as "90 per cent efficiency." Assuming a 90 per cent efficiency, Figs. 3 and 4 show the thickness of insulation required on a 300 F pipe buried in two types of soils. One characteristic is apparent: very little insulation is needed to limit heat loss to a satisfactory value on large pipes buried more than a few feet deep in soil.

Using the insulating value of the soil in this way introduces other problems: When the insulation thickness is limited, for instance, to that shown in Fig. 4, the temperature at the interface of insulation and earth cover is generally so high that it complicates the selection of a waterproofing material.

How Soils Affect Insulation Requirements

Commonly used corrosion protective methods depend upon an organic material to prevent ground water from entering the insulation covering, or to protect the casing around the insulation. Two prerequisites of this protection are that it (1) does not soften, and (2) remains in serviceable condition for the expected life of the system. Thus, the insulation surface temperature must be kept below the critical level at which protective coatings flow under pressure, and age rapidly.

A study of Figs. 5 and 6 indicates how different soils affect the insulation thickness when it is necessary to maintain specified temperatures of 120 F or 150 F at the interface of the soil and insulation. Figures 5 and 6 gain in significance when compared to Figs. 3 and 4. If heat loss is used as a criterion of insulation thickness, less insulation is needed when the pipe is buried deeply, and as the earth's conductivity decreases. Conversely, when the insulation surface temperature is the determining factor, greater thicknesses are required with increased earth cover, and for lower soil conductivity.

Therefore, the insulation thickness needed to protect the waterproofing on larger pipes buried more than one foot is much greater than that needed to limit the heat loss to the usually accepted value. As long as conventional insulating materials are used, the ability of the underground piping system to stand up against the mechanical forces and chemical actions encountered far outweighs the conductivity of the insulating material as a criterion for evaluating performance.

This indicates that the acceptable insulation contributing the most to "direct burial" underground line performance is one that offers the best solution to waterproofing and is the most effective from a moisture repelling standpoint.

Since an underground line must be waterproofed either on the insulation surface, or on the insulation casing, the next step to consider is the material characteristics that affect installation and maintenance costs.

First is the mechanical loading involved; an insulation able to support the pipe and its fluid load without the need for structural supports minimizes the labor and material required. Second, a material impervious itself to moisture penetration simplifies the application of the waterproofing coating. Third, an insulation having a compressive strength able to withstand trench backfill and overhead traffic loading eliminates the need for extra-cost structural enclosure. Foamglas, cellular glass material, produced by Pittsburgh Corning Corporation, Pittsburgh, Pa., is composed of countless sealed glass cells and is impervious to moisture pickup and penetration. It is well able to meet these requirements.

The rigidness of Foamglas can be utilized to provide expansion bends in any underground line. All that is required is to install oversize insulation, Fig. 2, at the bend and insert pad supports beneath the pipe. Where branch lines are taken off the main, oversize insulation on the branch, Fig. 7 and a slot in the main line insulation can be made into a moisture-proof expansion chamber.

A situation where numerous branch lines are fed from the mains exists in Virginia, Minnesota. In this city, a municipal plant supplies about 80 per cent of the inhabitants with heating steam.

City specifications called for the lines to be insulated and covered with concrete. But the concrete casing did not continue on over the service lines and surface drainage seeped into the old insulation at these points. Consequent pulping and drying out of the insulation caused it to become brittle and crack. The result was a 50 per cent loss in insulation efficiency.

To avoid this trouble on the new additions to the system, Foamglas insulation was used. Beside having the ability to exclude moisture, its structural strength permitted pouring of the concrete casing directly upon the insulation. This eliminated the need for forms and saved an estimated $35,000 on the installation. In the old sections, the insulating material was not strong enough to support the weight of the concrete.

Study Made on Costs

A study made by International Business Machines Corp. concerned an underground chilled water system which was to serve their new San Jose, Calif. plant, a seven-building project located on a 190-acre site. Overhead distribution was ruled out as too unsightly. The concrete tunnel method and pre-sealed conduit were eliminated because of cost; the first was estimated to cost two to three times as much as direct burial, and the latter 30 to 60 per cent more. The final decision was to use Foamglas insulation with direct burial in the ground, because it met all thermal, moisture repelling, and compressive strength requirements.

Its rigidity was an added advantage in speeding up the installation work. The pipe was insulated in sections above ground, the sections were then welded together, and the weld insulated before the line was lowered, Fig. 1, to a 6-in. bed of compacted sand in the trench. Compacting the sand with a high-frequency vibrator provided a flexible support to protect the line against excessive shock in case of earthquake. The line was then covered with a backfill of sand. **End**

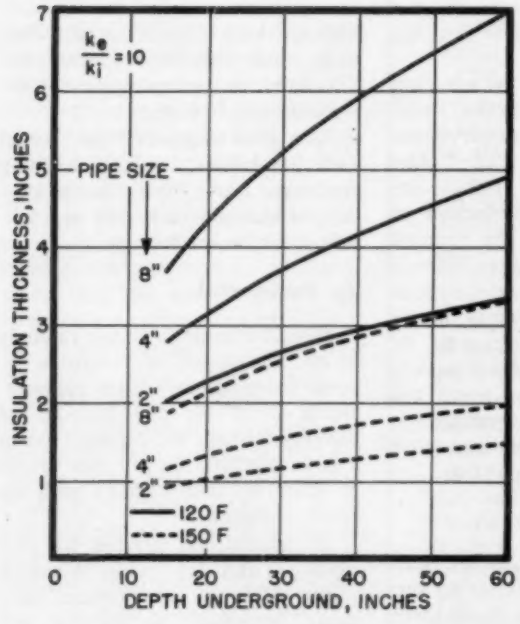
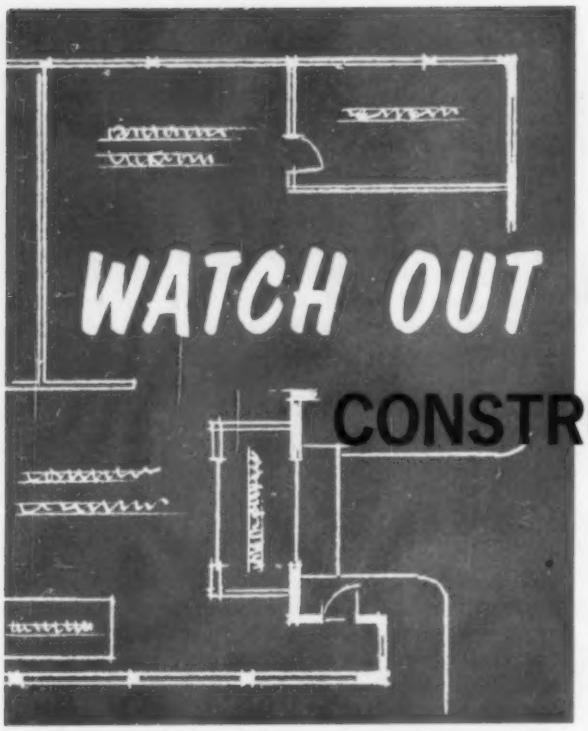


Fig. 6. Insulation needed for 75 F air temperature on 300 F pipe buried in soil with relatively low thermal conductivity, to prevent insulation surface temperature exceeding 150 F.

Fig. 7. Tee insulation. Oversize pipe covering on leg, slot in main, permit movement when pipe expands horizontally.



WATCH OUT for Those CONSTRUCTION EXTRAS

They have a habit of costing double what they would have originally

By BURKE W. WOMBACHER, General Building Contractor and Plant Engineering Consultant

"THAT'LL BE AN extra!!"—This is a familiar phrase to any plant engineer who has been involved with construction contracts.

You can be sure that there are errors in the most carefully planned job and that the larger the job, the greater the possibilities of extras. You can also be sure that the contractor will spot some of them on a cursory inspection of the plans.

How can this be after such careful planning? Well, it is because thinking and planning are one thing and doing is another. A lot of people might be able to write a book on "How to run a lathe" but couldn't possibly go out and run one efficiently. The contractor is the doer and he knows that what looks good on paper is not always feasible in the field.

Let's have a look at some of the factors that commonly cause extras:

1. Crash program planning

The idea of building a plant may exist for a long time in the minds of management, but when at last the project is funded and a decision is made to build, there are seldom any detailed construction plans.

It is then typical of the company to want plans practically overnight. This forces the architects and engineers to crash out a set of plans that obviously cannot reflect any carefully calculated perfection of detail. Some such jobs are planned, bid and the building started before a city engineer has checked the plans. You can also be sure that no matter how excellent the plans may be, the city engineers or others will have to put in their two-cents' worth and cause the plans to be modified.

Such crash programs are obviously a fertile field for extras.

2. Salesmanship

The contractor may be an excellent saleman and sell extras by suggestion. A door here, a closet there, some additional outlets, a few more switches, etc., can all add up to a tidy sum.

3. Busybodying

If you have a lot of big-wheels at the top level to please, you may be forced to add a lot of extras. They may also busybody around the job, suddenly becoming—overnight—construction experts.

As a plant engineer I can't stand such busybodies, but as a building contractor I love them, because they suggest extras which give my billfold a fat, warm feeling.

4. Accidental

What I consider a classic example or an "accidental" is an experience some years ago as a plant engineer. Being hired for the purpose of pushing through the construction of a large machine shop, I was forced to share my responsibility with the plant manager.

In general, he minded his own business and we made decisions jointly. However, one of these "accidents" happened: As the story was told and retold many times later, the painting contractor's foreman asked the plant manager a simple question: "What colors do you want the piping painted?"

A short time later the plant manager asked me another seeming-

ly innocent question regarding the standard color code for piping. My answer was that it was largely a matter of individual choice and mentioned some colors—red for natural gas, yellow for air, green for water, etc.

A few days later the piping was painted. The painter told me that the manager had okayed the job, the manager confirmed that he had given the painter the colors, and I mentally said to heck with it.

In this case, I was probably as much to blame as anybody for not making sure of the issue, as I knew positively that painting of the piping was not included in the contract. The plant manager and the contractor also had the plans and specs and it was reasonable to assume they knew it too; so I thought.

End result: a $6000 extra; and a lot of argument and bad feelings all around.

Two years later the plant manager was long gone, but I was still around as the plant engineer and we built a second plant next to the old one for engineering, office and assembly.

This time there was good preplanning and I was firmly in the saddle with full responsibility and authority for the construction. The "classic example" and other fiascos on the last construction were still fresh in the minds of management (I had kept reminding them for two years) and they stayed away from the job completely.

Using the same contractors, except for the painter, I set forth with bulldog determination to set a new record for the completion of the construction without any extras. An almost impossible task—but I did it!

Here's how it was done:

1. First I had the advantage of having the same architects and engineers and time for good planning. I told them what I intended to do and then picked and picked away at their plans until I could no longer find the slightest fault; and incidentally I became quite unpopular with them in the process.

The County plan checkers found fault, of course, and we had to add another 16,000 lb of structural steel, more footings, etc., before going out for bids.

2. The next advantage was that we all understood each other. The contractors were told just exactly what I intended to do: eliminate any extras. I told them that I would help them and trade with them, but would not buy. Very skeptically they agreed to give it a try.

3. Once the construction was under way I practically forced help on them to get them indebted. I got them to use the table saw in the maintenance shop in the adjacent building, made them bolts, fixed their tools and trucks, furnished some pipe fittings from maintenance stock and provided many other favors and services.

Our plant guards picked up the job site on their rounds and saved the cost of a night watchman. Our first aid facilities, cafeteria, and rest rooms were made available to them. All of these things served to build up a pile of favor points at small or no expense.

The electricians got into a bind because the plans called for runs of rigid conduit in a subceiling crawl space area that was almost inaccessible. By letting them fish through flexible conduit instead, they saved time and money that paid for the extra convenience of additional outlets later on.

One section of the office area was built over an old filled ravine, and caissons were specified. At one spot they hit water at 16 ft and thought they were into the water table, and envisioned having to go down halfway to China for footing.

Fortunately I knew that the water table was at 80 ft because there was an old capped well on the property that we had planned to use for cooling a degreaser. I also knew from an old topographical map that the bottom of the ravine was formerly at about 16 ft, and therefore reasoned that the water had to be a small pocket of trapped seepage.

After putting on a big show to emphasize the cooperation to be expected from my side, I let them go to 20 ft and pour. As a result we saved both time and money on this one. **End**

How To Save on Expensive Extras

Here, in summary, is my message to management as to what it takes to save on those expensive extras:

1. Trust your plant engineer. Give him the responsibility, authority and recognition that he deserves as the expert on construction.

Be sure that he is on the job when planning starts and let him be the one to interpret the needs of the company to the engineers and architects.

2. Stay off the job and let the plant engineer supervise the construction without interference. Let him be the sole authority to approve any field changes or extras that cannot be avoided.

Do not worry about him; he is not too proud to ask for your help or advice when he needs it.

3. Get at least three bids on the job. Theoretically, all bids should be nearly the same. If there is a wide variation in the bids, get more, and especially watch out for the bid that is too low in comparison.

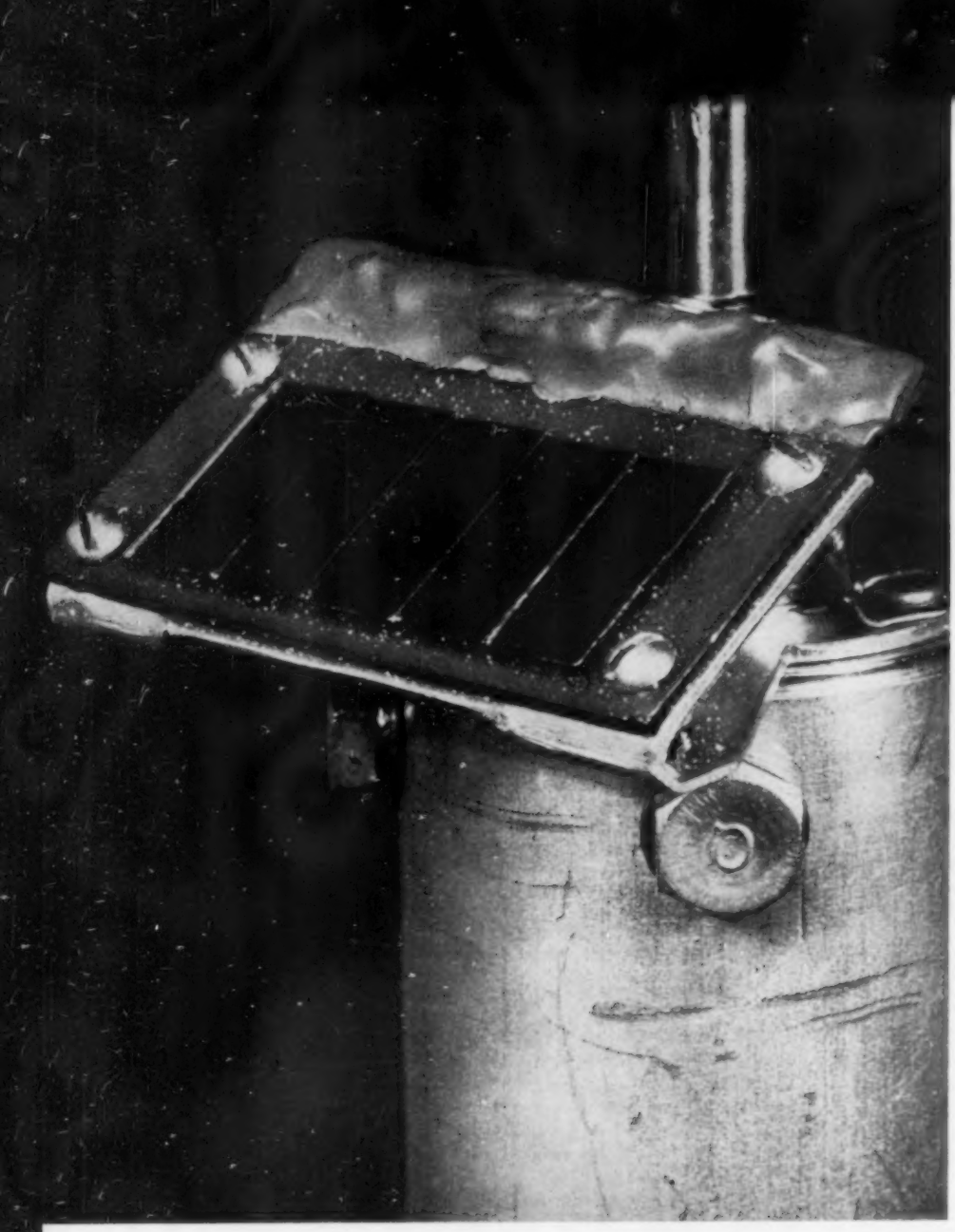
4. Establish a system for writing up an agreement and price for any extras or change orders. Keep in mind my trading plan that worked so effectively in one instance.

5. Thoroughly screen the extras that seem to be required. Maybe they can be done cheaper later by maintenance or another contractor. Or, most likely after a fresh look later on, many of the things that seemed so necessary or desirable at the time can be forgotten.

6. Do not lose your sense of values. It is commonly typical that management people who cautiously watch nickels and dimes often get carried away once they get into talking construction.

Suddenly they are talking and dealing in thousands of dollars in an abnormal field of construction costs and planning, so a few thousand dollars one way or another seems to have little meaning.

7. Again I say it is most important of all for you to have confidence in your plant engineer—trust him, and let him be responsible.



Solar sentinel consists of five small solar cells that need but a few hour's sunlight every 10 to 15 days to recharge transmitter's six nickel-cadmium batteries.

Photo on facing page is that of the solar sentinel. To change data sent back from the transmitter, operator merely exchanges "Code Buttons." A change in buttons can completely reprogram the transmitter. Thus, it will send back temperature data rather than flow data or vice versa.

SOLAR-POWERED TRANSMITTER MAY MONITOR DISTANT PROCESSES

UNATTENDED, a distant plant process unit works through the night. Suddenly, something goes haywire. As it does, an immersion thermometer diagnoses the trouble, sends a shot of "trouble voltage" to a tiny, solar-powered transmitter.

The transmitter—like a silent sentinel—flashes a warning across two miles of space . . . to the plant's central control board.

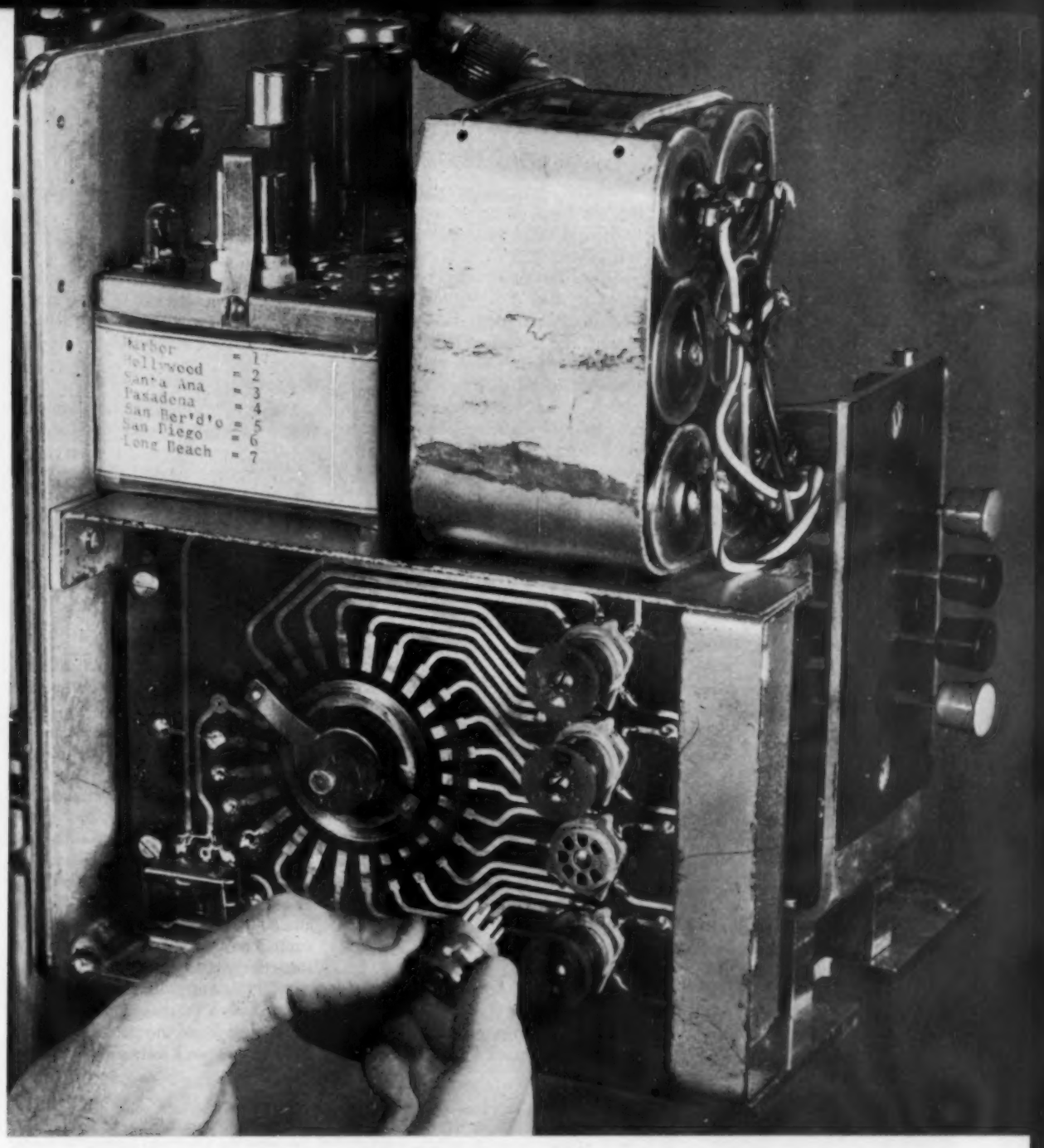
On the board, the trouble is spelled out in illuminated letters: "Unit 4 . . . High Temp . . . 190 degrees . . . Off."

Translated by the on-duty engineer (who monitors a dozen similar distant processes from his centralized trouble board), the message has stringent meaning:

"Unit 4's process *temperature* has risen to a dangerous *190 degrees* . . . the unit has been *shut off* automatically."

Minutes later the duty engineer is behind the wheel of his emergency repair pickup . . . headed toward Unit 4 and trouble.

Key to it all: a revolutionary sun-powered transmitter which, without overhead wires, buried cables or even a power source (other than the sun) for the first time hands plant



men a low-cost monitor of distant, unattended plant processes and their equipment.

The solar charged transmitter—its cost pegged as low as $300—has special significance for plant men charged with overseeing remote units.

1. As a forerunner of many another sun-powered plant device, the new solar sentinel ushers in an era of solar-cell dependability. So efficient are the transmitter's five tiny sun cells that they keep the unit operative even though no direct sunlight bathes them for periods of up to 15 days.

2. A space-tested energy collector has literally been brought down to earth—and turned plant-useful.

3. Sun-powered, a host of other solar devices will shortly help plant men cut costs—simply because solar-run meters, gages and monitor devices can be integrated into a process, completely independent of the usual power sources . . . and costly wiring.

The emergency distant-process monitor—that soon may be along a four-mile stretch of freeway in Los Angeles (permitting stranded motorists to pushbutton for help)—bids to cut costs for refineries, power plants, utilities, including pipeline operations), chemical complexes and others which must keep tab on remote processes.

(Please turn page)

TRANSMITTER MONITOR DISTANT PROCESSES?

As the first workable solar-powered in-plant trouble spotter, the device can put out as many as 20 trouble calls an hour, upwards of 100 to 150 messages between recharges . . . and remains charged and operative.

As importantly, the solar sentinel broadcasts on a clear-channel emergency frequency, thus punches its messages through regardless of other communications that may be clogging the airways.

No Wiring Needed

But its biggest appeal to plant men lies in the fact that it requires no costly wired link-up with its centralized monitor board . . . nor can a power failure put it out of action.

Says an engineer for Hoffman Electronics Corp. Los Angeles, developers of the "safety satellite": "The only major power failure that would affect it . . . would be if the sun burnt out."

The unit's range: upwards of 25 miles, sufficient to link almost any plant and its processes, no matter how remote. Or, for that matter, such closeby facilities as deep-well pumps, sewage disposal plants and unattended power houses.

What It Does

But let's take a closer look at this, a process monitor extraordinary:

As currently envisaged by plant men who've previewed the "satellite" in action, a typical industrial setup might see anywhere from a handful to a dozen remote processes keyed to the solar monitor.

In tank-farm operation, for one example, a single transmitter, set midcenter of the farm, its coaxial-antenna rising some 20 ft in the air, would pick up trouble signals from every tank in the complex.

Having been alerted by a "trouble voltage" from one of the tanks or its pumps, the transmitter would flash its warning to the central board.

Special printed circuitry, built into the transmitter, permits a variety of data to be beamed to the central office.

How? Well, each tank, pump and pipeline and their controllers are tied into the transmitter's printed circuit. To change the kind of information the transmitter flashes, engineers need merely plug into the circuit a kind of miniature button. The button—called code plug—connects some pre-printed circuits, bypasses others.

Merely substituting code plug X for button Y might, for example, "instruct" the transmitter to monitor only process temperature data where, before, it had monitored flow rates.

"It's as easy as that . . . to vary what information you get back from the transmitter," explains one engineer.

"Substitute circuitry data buttons . . . and you change the whole pattern of data . . . without changing a single wire or calling in a data expert to 'program' the device, as is necessary for big data gatherers," he continues.

In plant applications, a solar emergency net would be both quick to install and inexpensive.

The transmitters—which cost as we've said about $300—beam to a single control-center receiver, price-tagged about $250-$275. Add another $50 or so for two 20-ft antennas (one at the transmitter, the other serving the plant's central receiver), and costs for a single application shape up to around $600-$625. Graphic display units, of course, would cost considerably more.

A solar hookup, in fact, is often cheaper than telephone communications though not as versatile, since the solar is a one-way signal system, not a two-way conversation unit.

It's been estimated, for example, that to equip one mile of turnpike or freeway with eight emergency telephones would cost about $8000 (biggest cost: buried cable). By contrast, the same mile can be solar-monitored by eight transmitters for about $3000.

Cell Cost Drops

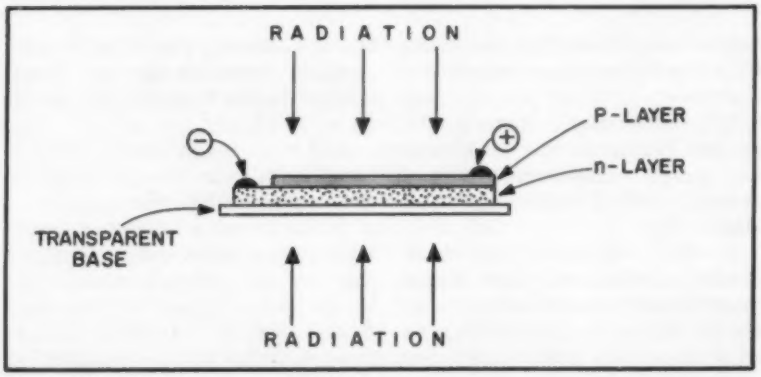
Silicon solar cells, once priced out of range of most plant applications, have sharply fallen in price while their efficiency has risen.

Back in 1955, for example, a single (1 x 2 centimeters) solar cell cost about $25.00 and efficiencies were in the order of 6 per cent (that is, from a square yard of cells you could wring but 54 watts).

Today, solar cells cost as little as $5 to $10 a cell and their "guaranteed" efficiency is about 13 per cent. Thus, from a square yard of sun-energy converters you can expect 117 watts, twice the output possible five years ago for but one-fifth to one-half the price.

Such low cost versatility of solar

Diagrammatic representation of the manner in which a silicon solar cell converts radiation (sunlight or even artificial light) into electric current. Layer P is coated with arsenic, layer N with boron. At PN juncture the electrical current is made.



This is a typical central receiver station. One shown here is for freeway police transmitter. Same kind of visual watchdog can tend plant processes.

Below is a prototype model of emergency calling solar-powered transmitter which has in-plant as well as distant process monitoring uses in plants.

communications is sure to find in-plant applications as an alert against fire (transmitters triggered by heat sensors) or burglary (a guard, walking his plant rounds, would merely punch a transmitter button to signal that all is well).

The transmitter's six miniature nickel-cadmium rechargeable batteries (they closely resemble flashlight cells) put out 1.25 volts each, a total 7.5 volts. Five silicon solar cells (set atop the field transmitter or, to thwart vandals, on top of the antenna) amass a total of two volts of electricity, require only a few hours of sunlight every 10 to 15 days to fully recharge the batteries.

Silicon cells are the same type as those powering U.S. satellites. Typically, a solar cell (seldom more than one inch long and about 1/25 in. thick) is composed of two slices of super-refined silicon. One, the "N" (negative) layer, is coated with boron. The other, the "P" (positive) layer, contains arsenic. Bonded together, their area of meeting is called a "P-N" junction. It is here —at the juncture—that an electrical field is created.

When light, solar or artificial, bathes the cell's surface, a voltage difference occurs across the P-N junction. Apply a load across the cell, and electric current flows, the result a direct conversion of light to electrical energy.

It is energy enough, say solar cell experts, to power many a low-power plant device . . . particularly critical process controllers and signal circuits. And in the "emergency satellite" they've proved it: have, for the first time, handed maintenance men a practical plant-applicable, sun-powered trouble-shooter.

Solar sentinels? They seem destined to monitor many a distant, unattended plant process. **End**

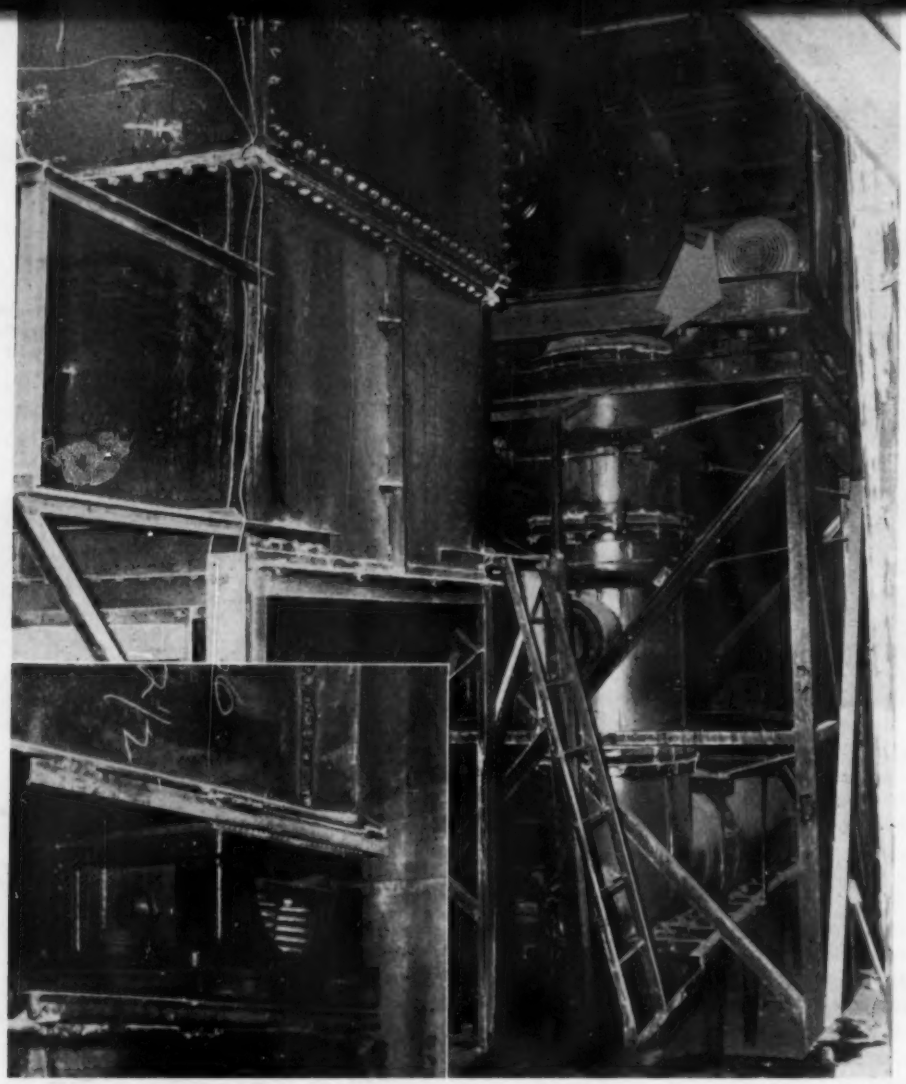


Fig. 1. Fan noise resulted in local disturbance. Corrective measures included spring mounts.

Effective Solutions for . . .

IN-PLANT VIBRATION PROBLEMS

INSTRUMENTATION, automatic in-plant functions, air conditioning units, close tolerances in the realm of electronics, and the advent of human engineering, force plant engineers to place renewed emphasis on problems of in-plant vibration and noise controls. Plants equipped with optical comparators, analytical and micro-balances, computers and even instrument rooms must safeguard their operations against the transmitted vibration and shocks of heavy machinery—and the disturbance of trailer trucks and railroad cars.

A large exhaust fan on an overhead steel structure in a corrugated sheet metal building at the T. A. Edison Inc. plant generated noise which disturbed residents nearly 700 ft away, particularly at night. Corrective measures included strengthening of the structure, replacement of steel deck (which could vibrate like a diaphragm) with open grillwork, and use of steel spring mountings to stop transmission of vibration to the sheet metal building walls to prevent their acting as secondary sound sources. See Fig. 1.

Vibration and noise transmission through piping, particularly on air-conditioning installations, is a serious problem. When refrigerating compressors are installed on resilient mountings, provision should be made for flexibility in the discharge and intake piping to reduce vibration transmission.

Flexibility can be attained either through the use of flexible metallic hose (which must be of adequate length and very carefully installed in strict accordance with the manufacturer's specifications) or by providing for it in the piping itself. This

is often accomplished by running the piping for a distance equal to 15 pipe diameters both vertically and horizontally before attaching the piping to the structure.

Additional protection is provided by suspending the piping from the building on resilient hangers or by supporting it from below on resilient mountings. Flexible rubber hose approximately three diameters long should be used on the intake and discharge sides of a water pump. Flexible duct connections should always be used on the intake and discharge of fans, and such flexibility should not be nullified by subsequently covering the duct with rigid insulation on air-conditioning installations.

Properly designed mountings now also permit installation of the heaviest mechanical equipment on upper levels. Frequently, such upper-floor installations permit certain operating economies and release valuable basement space. When heavy machinery is installed on upper floors, great care must be used to prevent transmission of structure-borne noise and vibration. This often shows up many floors below when a wall, ceiling, or even a lighting fixture happens to have the same natural frequency as the disturbing vibration.

Efficient mountings permit lighter, more economical construction of new buildings and prevent difficulties when machinery is installed on the new concrete-filled ribbed metal deck floors.

A centrifuge was installed at the Sherwin-Williams' linseed oil mill in Cleveland on a 10-in. thick reinforced concrete upper floor. A rectangular opening directly fronting it was used for gravity discharge of clarified oil. The vibration from the centrifuge, running 24 hours a day, seven days a week, cracked the floor.

Remedy? The installation of mountings with adjustable chocks to resist belt pull and make a structural base unnecessary.

Result? Highly satisfactory control of vibration, prevention of further damage to building, and proof that heavy equipment can operate on upper floors for economical gravity flow of materials—without special foundations. Close tolerance operations on floors below remain undisturbed.

In an underground laboratory of Bausch and Lomb Optical Company, Rochester, New York, there is a ruling engine for making diffraction gratings. The machine is so sensitive that if you stand over it for a few minutes it may be thrown out of adjustment for hours.

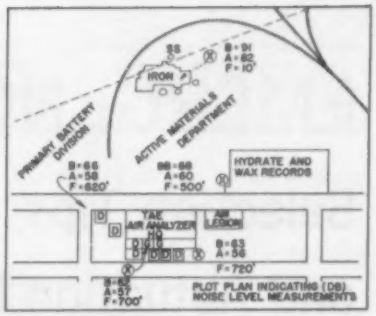


Fig. 2. Plot plan showing noise levels at various distances from large fan.

The slightest temperature change may cause intolerable errors in its work. Its job is to cut grooves in a thin aluminum coating on glass with such precision that 180,000 grooves can be made in a six-inch length of glass.

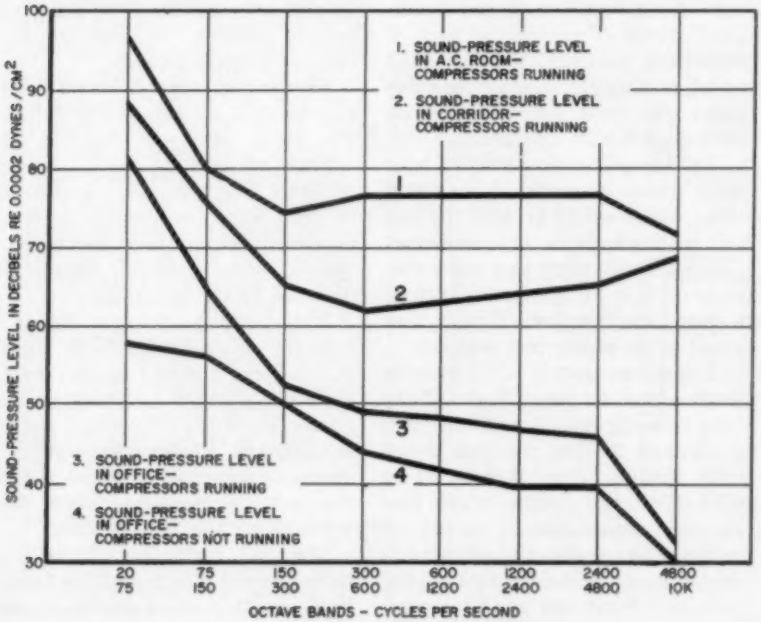
Heat from a person's body may expand the grating machine by as much as 1/10,000,000 in. Therefore, the laboratory is built on solid rock with side walls 21 in. thick. Walls and ceiling are covered with sound absorbing material. And the floor is 13 in. thick.

The grating engine is mounted on a three-ton block of concrete and the entire mass is supported on vibration-absorbing steel springs. An aluminum room has been built around the instrument. A special air-conditioning system prevents the temperature from varying more than 1/10 degree. For further isolation, some of the engine's operating parts are floated in mercury.

The testing and researching laboratories of Esso Research and Engineering Company at Linden, New Jersey, use intricate equipment to develop new motor fuels and lubricants, as well as to improve the performance of existing products. Equipment ranges from light instrumentation to heavy engines, test stands, and dynamometers. Much of it is exceptionally delicate and calls for high accuracy. Adjacent heavy equipment (engines and dynamometers) creates vibration and disturbance due to inherent unbalance.

The plant engineer's problem? Eliminate vibration transmission. Here's how: vibration-producing equipment in the laboratory is mounted on foundations that "float" on spring isolaters. **End**

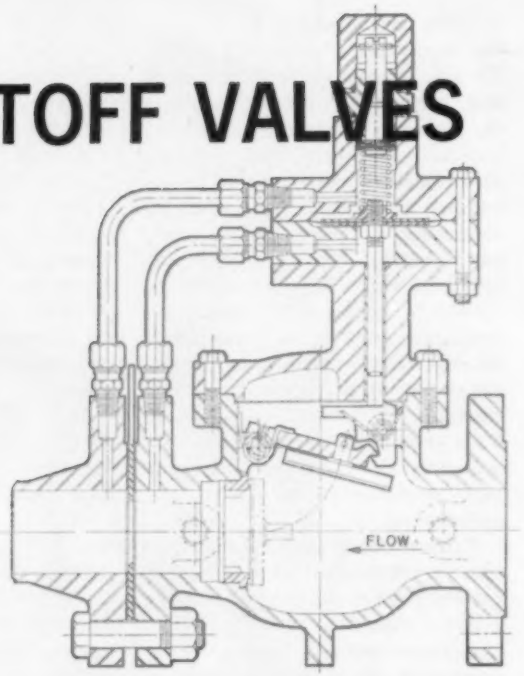
Fig. 3. Mountings of one type on which air conditioning compressors were supported were replaced by spring units; readings corresponding to curve 4 resulted.



EMERGENCY SHUTOFF VALVES

Selection Tips and Actuation Methods

By CHESTER S. BEARD, Chief Engineer,
Valve and Actuator Div., General Controls Co.,
Glendale, California



Courtesy Coppus Engineering Corp.

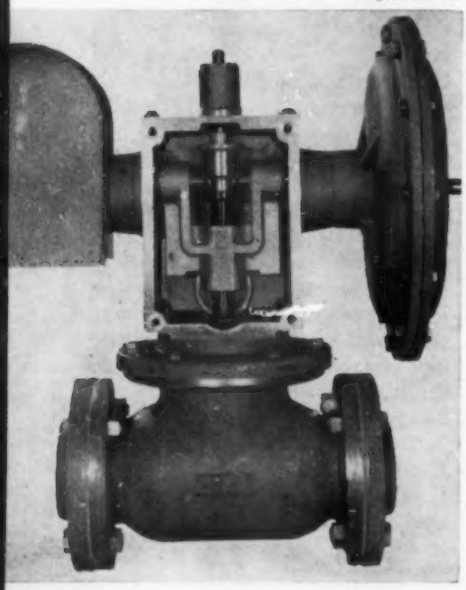
Fig. 1. Excess-flow differential pressure causes the stem to travel resulting in latch release to close the valve.

RELIABILITY is of utmost importance in any emergency function and is no less important in an emergency shutoff valve. Most of the acceptable valves for this use have been passed by one or more of the agencies set up to test equipment and issue approval for its use. Criteria for approval assuming emergency action in closing includes:

1. Opening, whether manual or automatic must not be possible unless holding medium is applied.
2. Closing must be rapid; in all cases to take less than five seconds.
3. The valve actuator must be designed so that it can be sealed to prohibit its being bypassed readily or blocked open.
4. Blocking the handle of a manually operated valve must not prevent closing when the holding medium is cut off.
5. Valve must close automatically upon loss of holding medium.
6. An actuator must have sufficient stored power in the way of pneumatic pressure, a compressed spring or a weight, to close the valve under the most severe conditions prescribed for its operation.

Fig. 2. Valve closure can be effected by electrical or diaphragm response.

Eclipse Fuel Co.



The foregoing requirements have been stated in terms of a shutoff valve which would be used for fuel or a heating medium. The same characteristics will apply to a valve that must open in an emergency such as a quenching function or coolant to a coil in an exothermal solution.

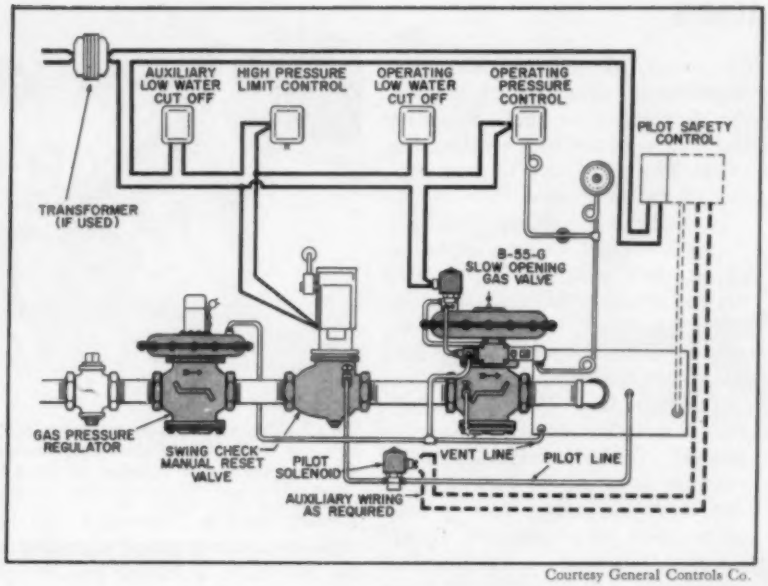
Emergency shutoff valves must be single-seated for positive shutoff. In most cases the flow through the valve is directed to hold the seat closed after closure. Trim is selected to withstand the temperature and chemical composition of the flowing medium. As a majority of the oil-valves are on preheated fuel oil, the seat discs must withstand temperatures up to 250 F. Soft discs are required to hold gas successfully.

Valve must be designed with a minimum of hysteresis, consequently, packless types are desirable. The plug or inner valve must be well-guided and aligned to obtain proper seating or must be attached to the stem by a ball joint or some type of universal to allow the plug face to position itself on the seat face for positive closure.

Almost any type of valve body may be used for emergency shutoff. The swing gate style has the advantage of creating no restriction to flows. The gate may be allowed to drop when the holding hook is tripped by electrical or mechanical means. More positive closure is obtained by spring loading.

Very positive closure is obtained with the spring-loaded hi-flo valve. In one type, a strong magnet opens the valve through operation of the handle when the emergency circuit is energized. Rectified current to a strong electro-magnet allows use of this valve at pressure ratings that are high for this type of valve.

The "S" body (Fig. 5) with a spring-loaded plug gives high capacity flow with positive closing. A gate



Courtesy General Controls Co.

Fig. 3. Example of a gas supply system which includes safety controls and a control valve and a swing check unit.

which swings across the line of flow allows full line capacity and offers a form of shearing action to sever foreign matter. This type of movement requires considerable force on the surface seals which may create a certain amount of hysteresis.

Since butterfly valves have been made with soft liners for positive shutoff, they have entered this field. Sufficient stored energy must be available to move the clapper through the high torque position and to hold the valve closed.

Globe valves are used extensively but are usually overported to obtain a low pressure drop. The type in which the seat disc is carried on a diaphragm eliminates friction which may be caused by stems or shafts.

A previous article (PLANT ENGINEERING, Feb. 1960) stated that energizing mediums for emergency systems could be mechanical, electrical, hydraulic and pneumatic. Even though the valve must be designed to fail in the safe position upon loss of the energizing medium, the reliability of the medium is paramount. Inadvertent shutdown is costly and in many types of plants, conducive to abnormal conditions that may become dangerous. Electrical emergency systems may be backed up by either engine-driven generators or a bank of batteries.

A well-protected storage tank with energizing medium should serve one valve or at most a system confined to a small area. Tank pressure equal to the maximum of the supply system is guaranteed by installing a check valve in the inlet to the tank.

One use of an energizing medium is to cause an emergency valve to open or close as required. In most cases operation is caused by a spring or a weight. The valve must be put in an operating position either manually using a lever arm or screw or by use of an actuator which will operate from a remote switch or valve.

Another use of the energizing medium is to hold the valve in an operating position until the sensing instrument is actuated by an abnormal operating condition. The sensing instrument is a metering device such as a temperature switch. These instruments were explained in the article already mentioned.

In outlining the actuators, it often becomes necessary to cover the entire unit including valve and actuator. The approval agencies accept the two components.

The valve in Fig. 1 is triggered by an increase in flow rate sufficient to create a differential across the diaphragm of the pilot in excess to the spring setting. This moves the trigger releasing the swing check to close by its weight and the effect of the flow. A somewhat similar triggering occurs (Fig. 2) in which holding pins will not allow the valve to close until pressure on the diaphragm varies beyond a spring setting or the solenoid-operated pin is moved through energizing or deenergizing by a remote sensing instrument.

Solenoids are used extensively for

Courtesy General Controls Co.

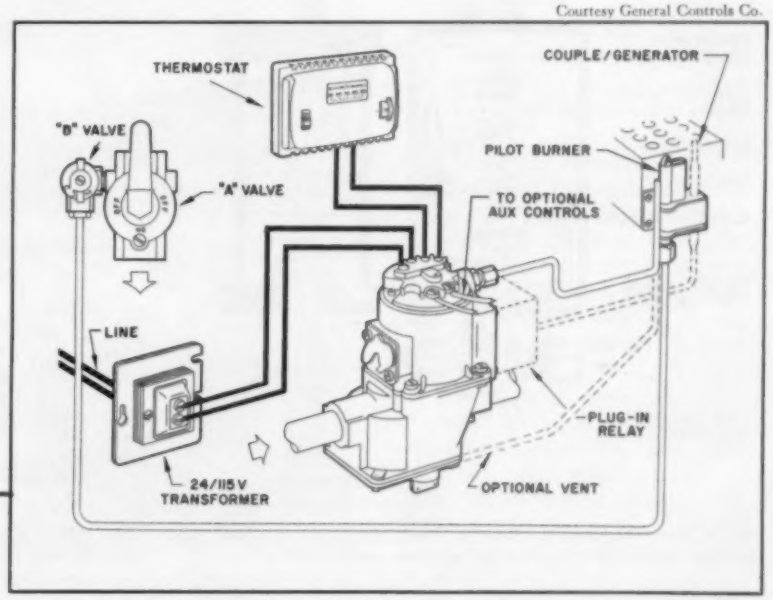


Fig. 4. Such an arrangement has valve responding to thermostat settings. In emergency thermopile effects closure.

EMERGENCY SHUTOFF VALVES

operating emergency valves. For emergency shutoff use, the solenoid-operated valve must close rapidly and positively upon loss of current. Opening must not be possible unless current is restored.

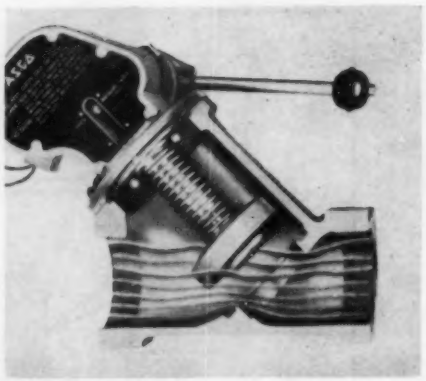
One method is to create a magnetic field in an iron core so that when it is pushed down to meet the core of the valve plug, attraction takes place. Upon release of the reset button, the cores and plug are pulled up by a strong spring. Loss of current allows the bottom core and plug to drop.

A normally closed diaphragm control valve may be closed by action of a three-way solenoid pilot valve which releases the diaphragm pressure to allow the spring to close the valve. A direct-acting regulator may be placed in the supply pressure of a controller to shut off the air upon decrease in downstream line pressure, thus shutting off the line valve. Solenoids may be used to trigger the holding mechanism of many types of valves.

The emergency function may be combined with a control function if the features required for emergency shutoff are retained. This is the case with the gas valve in which gas flow is proportionally controlled by either pressure or temperature. A secondary solenoid emergency controls low fire. In the event of de-energizing of the emergency circuit the primary solenoid overrides other functions to equalize each side of the diaphragm to allow a spring and weight of the trim to close the valve. This also occurs upon rupture of the diaphragm.

Both the swing-check valve and the gas control valve are used in the gas line to a boiler. See Fig. 3. The gas control valve functions as a control of steam pressure through its steam pressure element. It also acts as an emergency shutoff from the "Operating Low Water Cut-Off" and "Operating Pressure Control" switches. The "Manual Reset Valve" operates to shut off fuel upon a dangerous low water level or dangerous high steam pressure. In addition, the pilot safety control which senses the evidence of flame will shut down the main gas line as well as the pilot line through a small solenoid valve.

Electrohydraulic actuators will return to a fail-safe position upon breaking the two-wire operating circuit. The actuator (Fig. 6) is an oil-immersed motor-driven pump causing hydraulic pressure to drive a piston. A relay-operated spill valve releases pressure on the piston for spring return. Use of two relays allows for closing the valve in normal operation when the valve is used for control but causing rapid closing when both relays are de-energized by a pressure or other



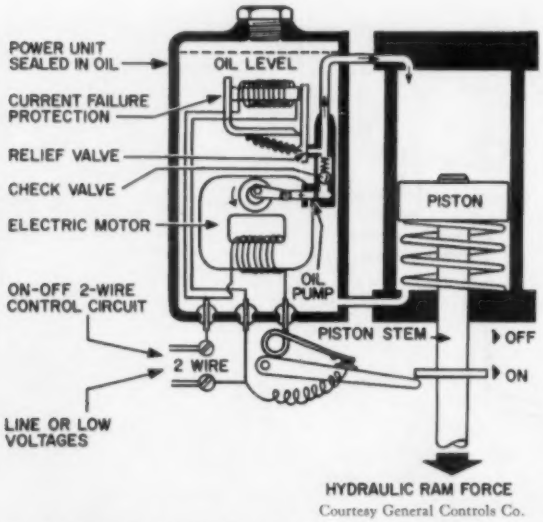
Courtesy Automatic Switch Co.

Fig. 5. The porting design allows high capacity flow. Visual indicator shows whether the valve is open or closed.

sensing switch. Operation of the relay has been reversed and isolated for automatic or manual remote operation from a d-c emergency battery circuit. This system is used when a status quo condition is required at the approach of an unsafe condition. The operator may use his discretion in operating the valve for shutoff.

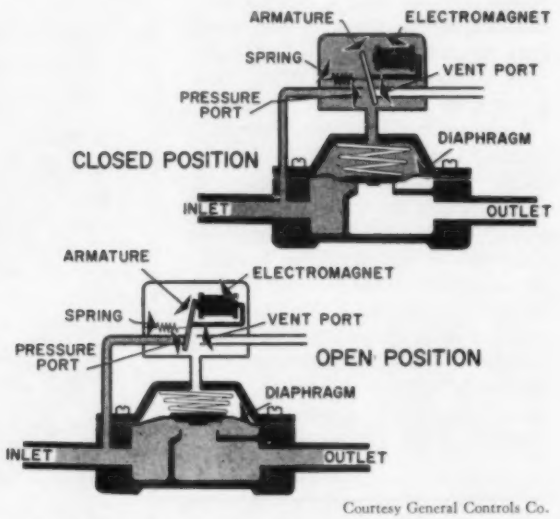
Tripping a valve for closure may be controlled by a filled thermal system. An important application for a shutoff valve is to discontinue fuel supply to an engine upon increase in jacket water temperature or decrease in oil pressure. In one valve either of these conditions will close a switch to apply magnet current to a coil that releases the swing.

(Continued on page 241)



Courtesy General Controls Co.

Fig. 6. Electrohydraulic actuator. Pump discharge actuates piston. Current interruption stops pump, opens relief valve.



Courtesy General Controls Co.

Fig. 7. In this type of valve, line and spring pressure combine to stop flow when failure drops thermopile current.

SPACE FRAME ROOF SYSTEM

Production-line roof sections set in place on building columns

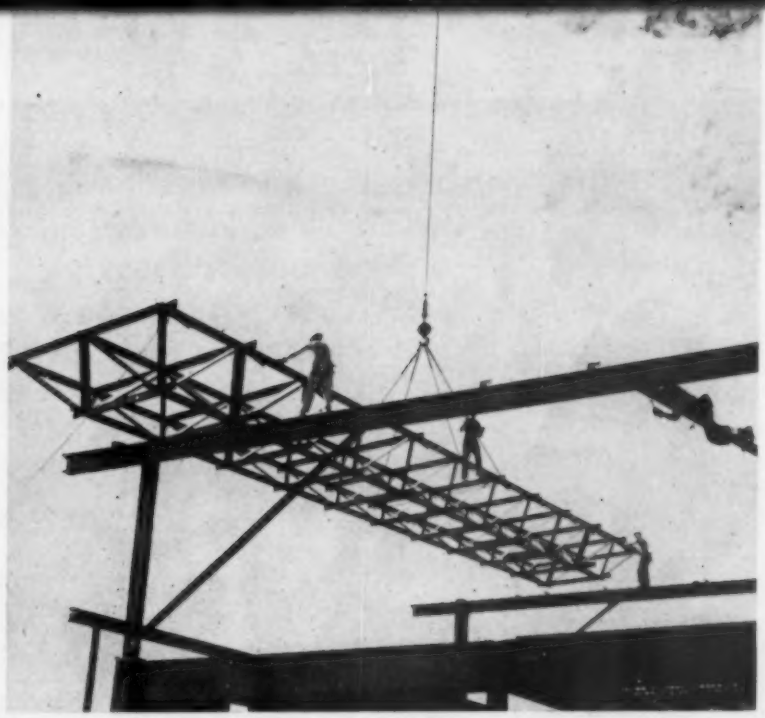
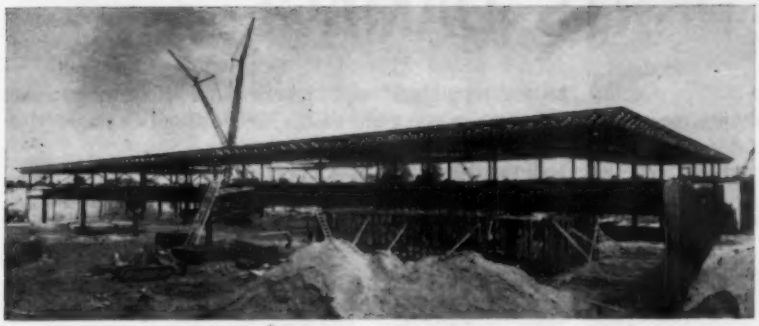


Fig. 1. Single prefabricated space frame roof unit is lowered into position.

PRODUCTION-LINE techniques have enabled the rapid fabrication and erection of one of the nation's largest space frames at Kalamazoo, Michigan, where a 450-foot-square office building is being constructed for the Upjohn Co.

Designed by Skidmore, Owings & Merrill, the structure is crowned with a 1200-ton steel space frame, fabricated and erected by Whitehead & Kales Co., Detroit.

To best combine the production opportunities with shipping and erection facilities, over 200 trapezoidal, triangular and parallelogram sections were fabricated in the W & K shops, then shipped to Kalamazoo for rooftop assembly.



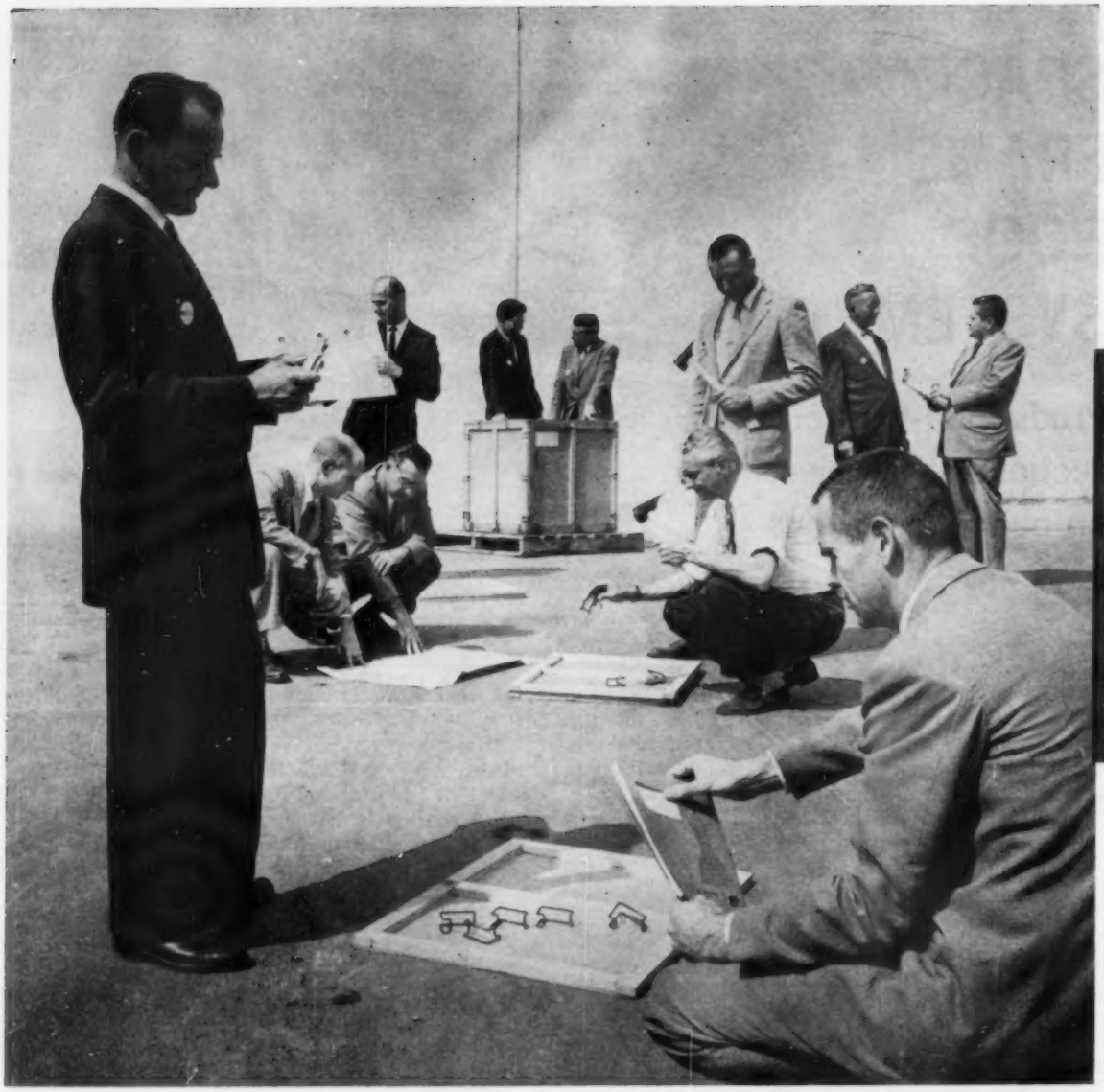
Figs. 2, 3. Progress photos show construction phases of space frame construction.

At the jobsite, a "table top" erection procedure was developed to assure perfect alignment of the various space frame sections. This erection method utilized a series of falsework beams bolted to roof-supporting columns for temporary alignment and positioning of the space frame sections.

A series of space frame sections was placed side by side on these beams, then joined together with diagonal members already attached to the top chord of one section and ready to pivot down to meet the bottom chord of adjacent section.

After a series of long space frame sections were joined, suspended sections were then raised into position between cantilever ends to complete the pattern. Falsework beams were removed after completion of the roof over one bay, and then moved to another bay.

A new type of expansion joint was employed in joining end-to-end sections. Instead of the customary bolt-in-slot, this joint utilized a square bar sliding in a slot. The bolt fits into the bar, rather than into the slot, thus eliminating point contact. **End**



MODULAR KNOCKDOWNS CUT REPAIR PARTS DAMAGE

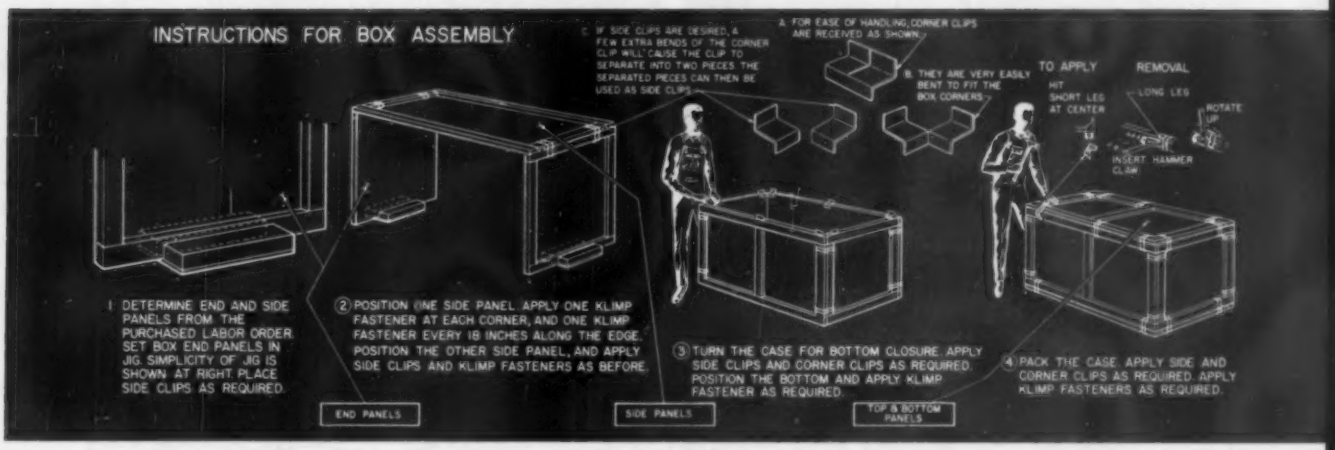
IN-TRANSIT parts damage reduced 89 per cent! Behind so striking a statistic lies an ingenious in-transit parts-protection system: pre-fabbed, knock-down boxes which fit any part, can be put together in seconds, reused scores of times—and, most importantly, can protect parts big and small from in-transit damage.

The "modular panel" protective system, adopted some seven months ago by Rocketdyne, a division of North American Aviation Inc., hands you, the plant engineer, a foolproof, low-cost, versatile method for getting repair and replacement parts where you want them, when you want them—and without damage.

How it works: With maintenance work-order and parts in hand, a departmental packager consults a "packaging" manual which tells him (a) the size of box he'll need; (b) the dimensions of the six panels that'll make the box; (c) the type of cushioning material recommended for the particular parts; (d) a "best method" for cushioning.

Thus informed, he merely selects the six just-right

This system of modular, knockdown boxes permits safe transit of delicate maintenance parts. Boxes are reusable, can be put together in just seconds, and cost just about $1.00 per panel. Complete description of the system and plans for a sectional packaging station are detailed in this article


INSTRUCTIONS FOR BOX ASSEMBLY
C. IF SIDE CLIPS ARE DESIRED, A FEW EXTRA BENDS OF THE CORNER CLIP WILL CAUSE THE CLIP TO SEPARATE INTO TWO PIECES. THE SEPARATED PIECES CAN THEN BE USED AS SIDE CLIPS.
A. FOR EASE OF HANDLING, CORNER CLIPS ARE RECEIVED AS SHOWN.
B. THEY ARE VERY EASILY BENT TO FIT THE BOX CORNERS.
TO APPLY
REMOVAL
HIT SHORT LEG AT CENTER
LONG LEG
ROTATE UP
INSERT HAMMER CLAW
1 DETERMINE END AND SIDE PANELS FROM THE PURCHASED LABOR ORDER. SET BOX END PANELS IN JIG. SIMPLICITY OF JIG IS SHOWN AT RIGHT. PLACE SIDE CLIPS AS REQUIRED.
2 POSITION ONE SIDE PANEL. APPLY ONE KLIMP FASTENER AT EACH CORNER, AND ONE KLIMP FASTENER EVERY 18 INCHES ALONG THE EDGE. POSITION THE OTHER SIDE PANEL, AND APPLY SIDE CLIPS AND KLIMP FASTENERS AS BEFORE.
3 TURN THE CASE FOR BOTTOM CLOSURE. APPLY SIDE CLIPS AND CORNER CLIPS AS REQUIRED. POSITION THE BOTTOM AND APPLY KLIMP FASTENER AS REQUIRED.
4 PACK THE CASE. APPLY SIDE AND CORNER CLIPS AS REQUIRED. APPLY KLIMP FASTENERS AS REQUIRED.
END PANELS
SIDE PANELS
TOP & BOTTOM PANELS

Opposite page: Department chiefs at Rocketdyne get indoctrination in the in-transit packaging system that has cut, according to Rocketdyne, parts damage by 89 per cent. Above: Detailed instructions for assembly of boxes. Right: Maintenance man, at work on a machine tool, carries parts to job site in one of the boxes to protect it from damage.

panels from a nearby bin, quick-assembles the box with special clamps, cushions the parts in pre-cut, reusable foam rubber (from a handy barrel which contains shock-absorbing material)—and dispatches the boxed parts, transit-protected, to the installation site, either in-plant or out.

Packaging time is seldom more than five minutes. Result: the certainty that parts will arrive undamaged at their installation site.

Once parts are installed, the box is knocked down, its six interchangable POV (paper-over-wood-veneer) panels returned "flat" to central storage—ready for reuse.

What's more, as few as 48 basic panels make up into as many as 259 different size boxes. Invest as little as $200 in panels (for this you get about 200 panels since they cost, roughly, $1 apiece to shop fabricate), and you have at hand the rough material for no less than 8000 different shapes and sizes of in-transit boxes. Boxes sized and shaped to fit any maintenance part save heavy production machinery.

Rocketdyne's new order to maintainers: "Box it—before you move it."

Abiding this order, departmental packagers recently put together more than 2000 panel boxes in the proc-

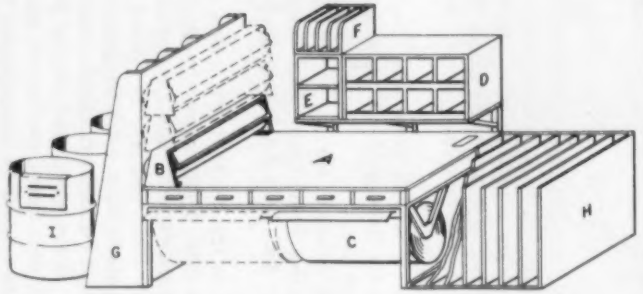
"SECTIONAL" PACKAGING STATION

NOTE

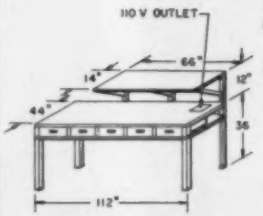
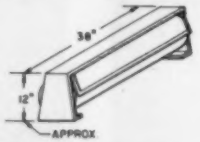
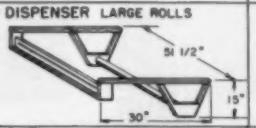
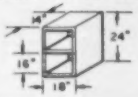
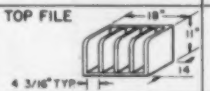
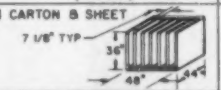
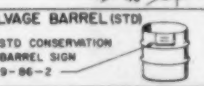
THE PRINCIPLE OF THE "SECTIONAL" PACKAGING STATION IS THAT ANY SINGLE UNIT, OR COMBINATION OF UNITS CAN BE ASSEMBLED TO SUIT THE REQUIREMENTS OF ANY INDIVIDUAL DEPT. OR AREA.

THE SECTIONAL PACKAGING SYSTEM CONSISTS OF THREE BASIC INGREDIENTS

1. SECTIONAL PACKAGING STATION
   CONSISTING OF UNIT "A" (BENCH), AND, AS REQUIRED, A COMBINATION OF ANY OR ALL UNITS AS DETAILED "B" THRU "I"
2. STANDARD INDUSTRIAL STORAGE RACK (NOT ILLUSTRATED)
   (FOR USE IN AREAS WHERE PACKAGING VOLUME JUSTIFIES REQUIRMENT)
   FOR STORAGE OF LARGE (FLAT) CORRUGATED CARTONS, CORRUGATED SHEETS, MODULE BOX PANELS ('KLIMP' SYSTEM), ETC. SIZE TO SUIT THE PURPOSE AND LOCATION.
3. AUXILIARY PACKAGING EQUIPMENT (NOT ILLUSTRATED).
   (ONLY FOR THOSE AREAS WITH SPECIFIC REQUIRMENTS FOR THIS EQUIP.)
   (a) STEEL STRAPPING KIT (COULD BE CONTROLLED THRU TOOL CRIBS)
   (EXAMPLE: SIGNODE STEEL STRAP DISPENSER, MODEL DF 10)
   (b) FLOOR STAND STAPLER OR STITCHER.
   (EXAMPLE: BOSTICH.)
   (c) BENCH TYPE STENCIL MAKER.
   (EXAMPLE: MARSH MFG. CO.)
   (d) SEALER, POLYETHYLENE BAG.
   (EXAMPLE: ZELLER BACH.)
   (e) SEALER, METAL FOIL BAGS AND POLYETHYLENE LINED BAGS.
   (EXAMPLE: DOUGH BOY MFG. CO.)



TYPICAL INSTALLATION SHOWING A COMBINATION OF ALL NINE UNITS

(A) BASIC PACKAGING BENCH 	(1) BENCH OF WOOD CONSTRUCTION (2) SHELF WOOD WITH ANGLE IRON BRACKET (3) DRAWERS - PURCHASE 4 OR 5 PIONEER STEEL STANDARD DRAWERS NO. R-2000	(1) SHELF STORAGE OF PACKAGING MATERIALS OR FOR HOLDING MODULES D,E AND/OR F. (2) BENCH TOP FOR PACKAGING. ONE END FOR MOUNTING ROLL PAPER DISPENSERS (MODULE B) (3) UNDERNEATH BENCH FOR MOUNTING MODULE C (4) DRAWERS STORAGE OF SUCH TYPICAL ITEMS AS: PACKAGING TOOLS, SPACERS & PLYWOOD DISCS, PLASTIC PORT COVERS, STAPLER (HAND), SHIPPING TAGS, LABELS, ETC. RUBBER STAMPS/PADS, PACKAGE MARKERS, ETC. (5) 110 VOLT OUTLET FOR: POLYETHYLENE BAG SEALER AND/OR DOUGHBOY SEALER FOR METAL FOIL BAGS, ETC.
(B) DISPENSER (PAPER, PLASTIC, ETC) 	PURCHASE Mc CLINTOCK PAPER & FILM CUTTER 36" WIDTH (ZELLER BACH PAPER CO.) (a) ADJUSTABLE TENSION (b) PYRAMIDS ONE ON TOP OF THE OTHER. (c) SHARKTOOTH BLADE (d) 36" WIDTH WILL HOLD ANY ROLL 36" WIDE OR LESS.	TYPICAL USE DISPENSING ROLLS OF: 1 BROWN KRAFT WRAPPING PAPER 2 WAX PAPER 3 POLYETHYLENE 4 ETC.
(C) DISPENSER LARGE ROLLS 	PURCHASE MASTER PACK CORRO-CUTTER ZELLER BACH PAPER CO. UNIT NO. 48 (a) ANTI-ROLLBACK FEATURE (b) HOLDS ROLLS 48" OR LESS IN WIDTH	TYPICAL USE 1 HOLDS AND CUTS SINGLE FACE CORROGATED PAPER 2 HOLD AND DISPENSE KIMPACK OR FELT
(D) BIN SMALL PACKAGING DETAILS 	1/2" PLYWOOD CONSTRUCTION WITH TWO BATTENS	TYPICAL USE STORAGE OF "KLIMPS", "KLIMP" CORNERS, END CAPS FOR FIBER TUBES, ASSORTED BAGS (PAPER, FOIL, POLYETHYLENE, CLOTH, ETC.)
(E) STORAGE BIN TAPE DISPENSERS 	1/2" PLYWOOD CONSTRUCTION	TYPICAL USE STORAGE OF 1 PAPER TAPE DISPENSER, (EXAMPLES), ZELLER BACH TAPESHOOTER 100-6 (HEAVY DUTY) & ZELLER BACH PACKER 3-S (LIGHT DUTY) 2 RAYON REINFORCED TAPE DISPENSER ZELLER BACH 3 TWINE, GLUE, ETC.
(F) DESK TOP FILE 	1/4" PLYWOOD CONSTRUCTION	TYPICAL USE MANUALS OF STANDARDS, SPECS, ETC CURRENT ORDERS
(G) BIN FIBER TUBES 	3/4" PLYWOOD CONSTRUCTION	USE STORAGE OF FIBER TUBES 1" DIA TO 12" DIA
(H) BIN CARTON & SHEET 	3/4" PLYWOOD CONSTRUCTION	TYPICAL USE STORAGE OF AUTOMATIC SET-UP BOXES, FLAT CORRUGATED BOXES, CORRUGATED SHEETS, AND PLYWOOD PANELS
(I) SALVAGE BARREL (STD) 	1 STANDARD STEEL CONSERVATION BARREL 2 STANDARD SIGN	USE SALVAGE OF: (TYPICAL USE) KIMPAK, FELT, FOAM RUBBER, RUBBERIZED HAIR

Drawing and description of easily-made packaging station. All or any portion of this station can be made and assembled depending on the requirements of a plant or packaging area. Packaging station can be used for modular or other boxes.

Closeup of modular box and the maintenance part it protects shows the size and code number key to quick setup.

Working from a sectional packaging station this Rocketdyne man quickly packages a part destined for shipment.

ess, over four week-ends, of moving an entire Rocketdyne production facility to a new plant some 30 miles distant from the old. Not a single damage report was filed. And, although some boxes were, in the move, used four times, the total "box loss"—due to damaged panels—totaled but five per cent of the some 3000 panels used in the move.

More routinely, Rocketdyne departmental packagers box repair items headed for in-plant destinations, cushion and box parts for such outlying facilities as Santa Susana (where rocket engines are fired) and Edwards Air Force Base (where Rocketdyne operates test facilities).

Modular-boxed, too, are the more than $150 million worth of production parts which annually flow department-to-department at Rocketdyne.

"Keys to the system," says A. A. Ameday, chief of Industrial Engineering at Rocketdyne, "are the interchangeable, reusable panels—the quick put-together fasteners (Klimps) . . . and an easy reference manual which literally turns the most novice packager into a veritable packaging engineer."

So let's study Rocketdyne's system closeup—the better to fit it to your plant:

Panels: Most, except for the largest, are paper-over-veneer, (POV), framed with 1 by 1¼-in. wooden battens. Boxes made from veneer panels can take weights to about 120 lb. Rocketdyne shop-fabricates its own panels.

Forty-eight different dimensioned panels comprise Rocketdyne's modular panel list, and make up into box sizes ranging from 10 in. by 10 in. by 10 in. to 4 ft by 4 ft by 4 ft.

Example: Rocketdyne's basic modular list includes panels sized, as shown in the accompanying table.

The basic modular list, then, includes only 48 different panel sizes. Big production facilities such as Rocketdyne may shop-fab as many as a hundred of each size, depending on daily box use . . . and needs. Smaller plants, by contrast, may need only four or even less of each size. Rocketdyne figures panel costs at $1 per unit (which includes both material and labor), pegs shop-time to make a single panel in about 10 minutes.

Clips: Rocketdyne fasteners are spring-steel "Klimps", a reusable fastener marketed by a companion subsidiary, Navan Products, Inc., 900 N. Sepulveda Blvd., Los Angeles 45, Calif. Klimps cost 5-cents apiece, are snugged with a claw hammer . . . and removed the same way (twist of the claw removes them).

On an average, 20 reusable Klimps are required to put together the four side and two bottom-top panels of a typical box. At most, for the largest boxes, some 32 Klimps are required.

Packaging station: Although Rocketdyne central-stores the bulk of its panels, convenient packaging stations, all of them standardized, are set up in various departments.

A typical "station" includes a basic work bench, vertical bins (holding upwards of 50 of the most

A simple jig, such as this one, is sometimes used in setting up panel boxes. Here a clip fastener is hammered into place.

MODULAR KNOCKDOWNS

frequently needed panel sizes) and a salvage barrel containing pre-cut, ready-to-use cushioning material.

In all, the "standard" Rocketdyne "sectional packaging station" includes nine different units: (1) the basic packaging bench; (2) a large-roll dispenser, handling wraps up to 48 in. wide; (3) a 36 in. wide dispenser for paper or plastic wraps; (4) small pigeonhole bin for storing such items as box clips; (5) desk top file—that holds the quick-reference packaging manual; (6) fiber tube bin—holds 1-in. to 12-in. diameter fiber tubes, useful in some packaging jobs; (7) panel storage bin—vertical storage for box panels or corrugated set-up boxes; (8) salvage barrel—stores such cushioning material as Kimpak, felt, foam rubber and rubberized hair; (9) bench bin for packaging tapes and twines.

Fifteen of these sectional packaging stations—including a number in Plant Engineering—are conveniently located throughout Rocketdyne's plant complex. All are supplied from a central storage depot.

Packaging for Protection: Suppose a maintainer has parts destined for a plant department, in-plant or out.

Quick reference to his packaging station manual tells him the box size he'll need, specifies the proper side, end and bottom-top panels needed, how many clips are recommended and suggests the proper cushioning material.

Binned within arm's reach are an array of sized panels (the size indelibly stamped on each). Close-at-hand, too, are clips and cushioning material.

Let's say he's quick-boxing gages destined for a distant plant boiler room. His manual tells him that the needed cube requires a box that's 18 in. by 24 in. Opposite this box size—in his manual—are listed the panels (by size and code number) to make the box.

Typically, he notes that to make an 18 in. by 24 in. by 20-in. box he'll need two H-6 end panels (each 24 in. by 20 in.); two F-6 side panels (20 in. by 20 in. each) and two I-6 top-bottom panels (26 in. by 20 in.). Put together with the 24 clips required (the manual also specifies the number of clips needed), the finished box will have a 6.6 cu ft capacity—proper cube for the gages he's packaging.

The actual put-together takes but seconds. Quickly, he selects six panels from the bin and, hammer in hand, sets their clips. Then, taking some cushioning material from the barrel, he swaddles the parts in foam rubber—clips the box's top in place and dispatches the gages to the work site.

Says Leif Skogstad, Chief Facilities Engineer, "While the system setup may take a bit of doing, once you've got your quick-packaging table placed and stocked, the box-making itself is a few minutes job at most."

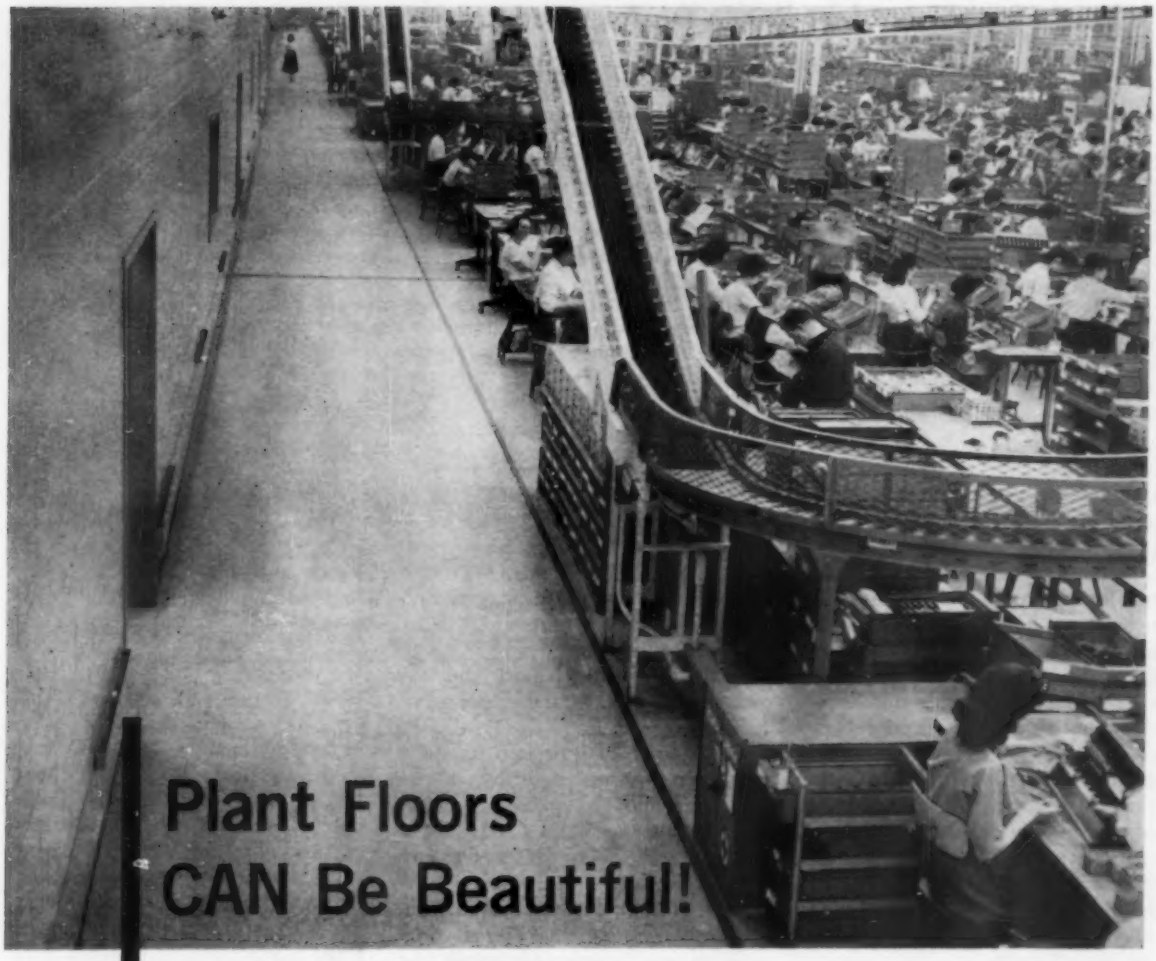
Those minutes, for Rocketdyne, have saved hours of wasted time. Time previously lost when vital parts arrived damaged. Or, worse, were lost in transit.

One sizable system advantage: many small, easily lost parts, can be handily boxed—all the parts for one job or installation kept together.

But probably the system's salient feature is its adaptability to any plant . . . regardless of size. The only difference, one plant to another, is the number of panels needed. The basic panels remain the same for all. So do the clips. And, of course, both of these boxing essentials are indefinitely reusable. **End**

MODULAR PANEL DIMENSIONS USED IN ROCKETDYNE BOXES

10 x 10	A-1	26 x 20	I-6
14 x 6	Special	26 x 26	I-9
16 x 6	Special	28 x 24	J-8
16 x 14	D-3	28 x 26	J-9
16 x 16	D-4	30 x 10	K-1
18 x 14	E-3	30 x 24	K-8
18 x 16	E-4	32 x 10	L-1
18 x 18	E-5	32 x 14	L-3
20 x 14	F-3	32 x 16	L-4
20 x 16	F-4	32 x 18	L-5
20 x 18	F-5	32 x 20	L-6
20 x 20	F-6	32 x 24	L-8
22 x 18	G-5	34 x 14	M-3
22 x 20	G-6	36 x 16	N-4
22 x 22	G-7	36 x 32	N-12
24 x 6	Special	38 x 18	O-5
24 x 14	H-3	38 x 22	O-7
24 x 16	H-4	40 x 18	P-5
24 x 18	H-5	42 x 18	O-5
24 x 20	H-6	42 x 24	Q-8
24 x 22	H-7	46 x 18	S-5
24 x 24	H-8	46 x 20	S-6
26 x 6	Special	48 x 18	T-5
26 x 14	I-3	48 x 42	T-17



Plant Floors CAN Be Beautiful!

HERE IS W.E.'s FORMULA FOR THEIRS

By T. D. THOMAS, Senior Engineer,
Merrimack Valley Works,
Western Electric Co.
North Andover, Mass.

RECENTLY, THE MANUFACTURING activities of the Western Electric Company in New England have been consolidated in a modern new plant known as the Merrimack Valley Works, North Andover, Mass. With the work of occupancy well on its way to completion, the attention of the plant engineers and factory planning engineers was turned from the erection and outfitting of the plant to a study of the ways and means by which the cost of building maintenance and services could be minimized.

One facet of this complex problem which was given considerable emphasis was the maintenance of approximately 1,000,000 sq ft of tile floor covering laid in the office and manufacturing buildings. Essentially two basic types of tile were used: 3/16-in. light colored, asphalt tile in all areas of the manufacturing building except the cafeteria, and ⅛-in. vinyl-asbestos tile of the same shade in the cafeteria and in the office building.

Both types of tile are specified by the manufacturer as being "greaseproof, highly resistant to most alkalis and other chemicals, as well as to fire, scuffs, stains, and moisture."

Under normal conditions prevailing in areas occupied by office functions this description can be taken literally. However, in manufacturing areas, tile floor covering is subjected to abuses beyond the intended scope of this claim.

For example, one of the most difficult problems encountered at Merrimack Valley was the removal of black rubber tire marks burned into the floor tile of the manufacturing area by powered industrial trucks. It was found that removal of these black burn marks was virtually impossible without damaging

To Keep Plant Floors Like W.E.'s You'll Need:

These Materials	This Equipment
1. Ammoniated liquid cleaner.	1. Rotary floor scrubbing machines.
2. A non-inflammable water emulsion resin.	2. Wet and dry vacuum pickup machines.
3. Grit cloths for rotary scrubbers (combination pumice-soap mixture as an alternate).	3. Rider-type floor sweeper used in main shop aisles.
4. No. 2 disc-type steel wool pads for rotary floor scrubbers.	4. Power driven floor scrubber used in main floor aisles.
5. Bell System wax-base sweeping compound for dust-laden areas.	5. Self-propelled, vacuum power sweeper used in main aisles of office building.
	6. 57-in. V-mops for sweeping sub-aisles of office building.
	7. Three compartment, 66-gallon capacity mopping tank.
	8. Twin-unit mop tanks with wringers.
	9. Miscellaneous brush and mop hand tools.

the tile in the process. In fact, in many instances tiles had to be replaced.

Although this was an extreme case, the materials handling engineers took immediate steps to seek a means to eliminate the cause, the lamp black in the standard tire compounds.

With regard to routine floor maintenance, since our previous experience with asphalt tile was rather limited, it was felt that maintenance of floor tile on such a large scale merited a reappraisal of our past practices and an investigation of the latest materials and techniques employed both within and outside of the Bell System.

Other Plants' Systems Studied

As an initial step, therefore, trips were made to the plants of local manufacturers as well as the Boston office of the New England Telephone and Telegraph Company, all of which provided valuable information on floor finishing. It was then decided that the various methods observed should be tried under actual working conditions in our shop and office areas. See Fig. 3.

Accordingly, five reputable floor cleaning contractors were asked to perform trials within our plant, each being given 10,000 sq ft of floor area to strip of old wax, clean, wax, and polish. On the basis of these trials we were permitted to test the working hypothesis and at the same time develop realistic yardsticks for material and labor costs.

Initially our plans called for using the Bell System anti-slip floor wax. However, from our experiments it was discovered that the resin type floor finish had distinct advantages over wax which made it more adaptable to the conditions found in our plant. Chief among these were the following:

1. Resin finish is more slip resistant than wax of comparable wear qualities.

2. It eliminates the need for buffing after application.

3. It is more resistant to grease and oil.

4. Resin finish spreads easily and more uniformly over a floor.

5. It is more easily removed with detergent.

With specific reference to the exceptional slip resistance of resin type floor finish it was found that to preserve this feature special precautions were required to avoid contamination of the resin with wax or alkali cleaner. These precautions may be outlined as follows:

1. Avoid the use of floor wax near resin-finished tiles since the tracking of wax over the resin finished area will adversely affect its slip resistance.

2. For cleaning, ammoniated detergent should be used instead of an alkali soap solution.

3. Use clean pails and mops uncontaminated by wax or alkali.

4. Clean rinse floor after wet pickup following scrubbing.

Of the five floor cleaning contractors employed on a test basis, two were finally selected to complement the work of our own service crews in maintaining the floors during the early stages of our building occupancy. Their labor price for stripping the floor of its old wax or resin finish, cleaning the floor, and applying two coats of resin finish average $0.0125 per sq ft. Western Electric provided both the liquid detergent and the resin floor finish for this work.

Procedure Established

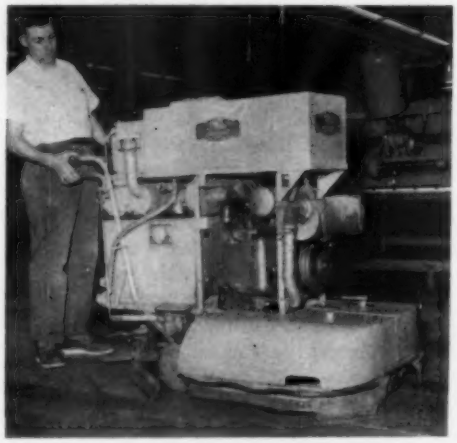
From our early trials and the extended experience with this joint cleaning program it was possible to establish a clearly defined operating procedure for this refinishing which may be described as follows:

1. Sweep area—use push brooms for all areas except the main aisles of the manufacturing building. Use the rider-type sweeper in the main shop aisles.

2. Remove gum, solder and wax buildups with putty knives or scrapers.

3. Apply scrubbing solution, one part of ammoniated detergent to ten

Fig. 1. Scrubbing and vacuum pickup machine is used for cleaning aisles.



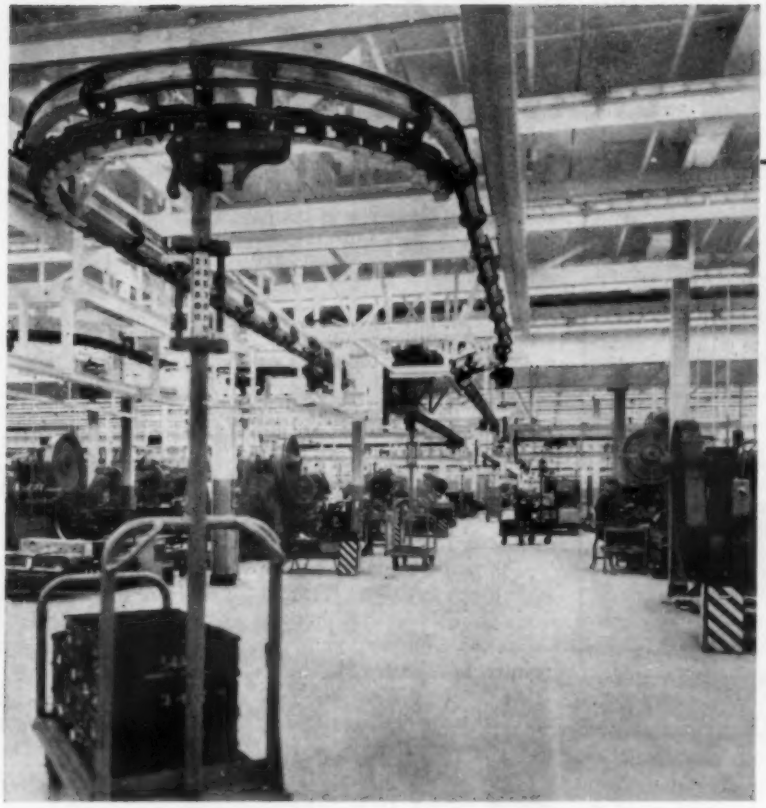


Fig. 2. In shop area, floors are kept immaculate by program outlined by author. Truck tires were changed to non-marking type to keep floors unmarred.

parts of warm water, with hand mops.

4. Scrub floors with rotary machines.

5. Pick up dirty scrub water with hand mops or vacuum machine.

6. Scrubber-vacuum machine is used for items 3, 4, and 5 in main aisles. See Fig. 1 and 3.

7. Rinse floor with clear water after pickup.

Fig. 3. As floor is scrubbed with rotary machine, vacuum picks up the water.

8. Apply two coats of the selected floor finish with 16-oz hand mops. Clean tools and pails should be reserved for applying the finish.

The more extreme floor marking problems were dealt with separately by our materials handling engineers. In attempting to eliminate the source of this problem it was found that non-marking compounds, free of lamp black, were available commercially. Furthermore, it was found that the physical characteristics of the tires made from these compounds compared favorably with the standard tires except for their lower resistance to cutting and chipping.

Since it was found that these "weaknesses" were of little consequence under the operating conditions prevailing in our plant, standard tires on all powered industrial trucks were immediately replaced with tires made of these non-marking compounds. On all purchases of new equipment, non-marking tires were specified. These non-marking rubber tires were obtained at a 15 to 50 per cent higher cost than the standard tires, depending upon the compound and hardness.

In addition to the steps taken to eliminate the black rubber burns in the tile, the materials handling engineers took the following remedial measures:

1. All steel wheels on existing trucks were replaced with non-marking rubber-tired wheels in the 70 to 75 durometer hardness range. It was found through experimentation that these tires insured ease of movement and, at the same time, resisted imbedding of foreign particles in the wheel face.

2. Hard narrow rollers on wheelers and dollies were replaced by wide rubber or plastic rollers.

3. The small metal dome-like glides on furniture legs were replaced with larger flat glides to better distribute the weight at each point of contact.

4. Rubber shoes were installed under each desk or table leg to prevent continuous shifting of the furniture which would mark the tile.

Based upon the results achieved to date with this far-reaching program, it appears that still further improvements can be obtained by continued surveillance over the cost elements of this job. For example, a check of the performance of the five floor cleaning contractors during the trial cleaning period revealed that the total elapsed time to set up and complete each area averaged 4.15 hr per 1000 sq ft. This labor rate applied to the office and manufacturing building and reflected additional effort involved at a time when contractors were moving and installing new facilities.

With near normal operating conditions now prevailing our own personnel have been able to reduce this labor rate to 3 hr per 1000 sq ft. The cost of the liquid detergent, resin floor finish, and other miscellaneous materials used to clean our floors currently averages $2.00 per 1000 sq ft. As our maintenance personnel become more adept with the methods described here, it is expected that further reductions can be effected in both labor and material costs. **End**

WHITE PAINT CUTS LIGHTING COSTS

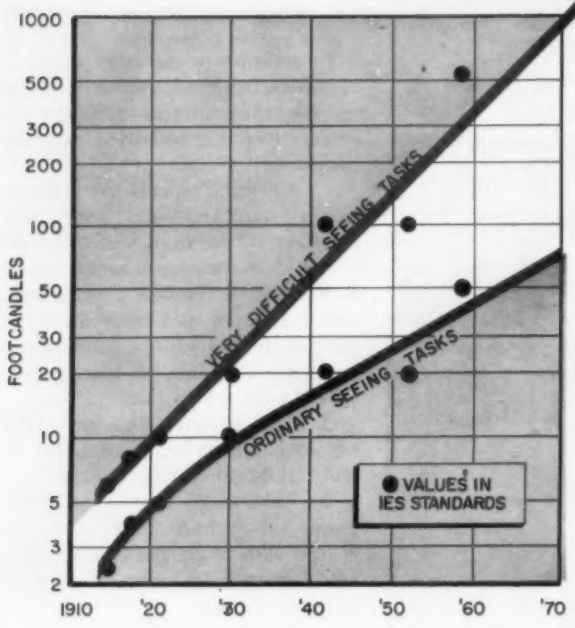


Fig. 1. Curves show trend towards higher lighting levels recommended by the Illuminating Engineering Society over the past five decades.

By JAMES A. MEACHAM, The Sherwin-Williams Co., Cleveland, Ohio

EXTENT of the move to higher lighting levels over the past five decades is illustrated in the graph, Fig. 1. Black dots are used to represent lighting recommendations of the Illuminating Engineering Society at various times up to the present, with smooth curves drawn to show the probable trend.

Potential for the future becomes even more significant when we note that the graphs are plotted to a logarithmic scale. The need for lighting levels of 300 to 500 footcandles (fc) for difficult seeing conditions has been well established by the recent studies of Dr. Blackwell, at the University of Michigan, and it appears that installations in that range may become common practice within the next few years.

Advent of the new higher lighting levels raises the question of application of the basic rules of color usage that we have followed in the past. Although lighting engineers are not always in full agreement on details, there seems to be no change in the general view on the use of color for lighting comfort.

On one point there is good agreement and that is that in the 50 to 500 fc range, light ceilings are essential for comfort and economy. To secure the maximum contribution, the ceilings should be white since white reflects more light than any other color. Furthermore, the reflectance factor of the white should be as high as possible.

There does not seem to be any limit on the reflectance that can be used on the ceiling other than the physical limitations of the white pigments themselves. Of course, in the case of the luminous ceiling, this comment would apply to paint used in area above the luminous plane.

White paint does reflect more light than any color and this may be demonstrated by comparing the light coming from a series of model rooms painted in different colors. Each room is equipped with a small lamp mounted in the ceiling and the quantity of light available, in each case, is exactly the same.

Compared visually, it is obvious that white is much superior to any other color. If we measure the light with a meter, we will find that the white paint gives several times the illumination obtained from a similar room painted in a dark blue.

As another illustration of the same idea, we can make two model rooms identical in all respects except one is painted white and the other a light gray. The gray is used to represent a white paint as it might appear after several years of service.

If we adjust the lamp wattages used in these rooms until they appear to be evenly illuminated we will find that we will need to use a 100-watt lamp in the gray room and only a 40-watt lamp in the white room. If we were to put 100-watt lamps in both rooms, the contrast in useful illumination would be quite obvious.

Experiments such as these indicate that ceilings should always be painted white, where illumination is an important consideration. However, this is not the whole story as there is considerable difference in the reflectance value of white paints. You can buy a white paint having a reflectance of 59 per cent. While it has the appearance of a true white, it will seem quite gray when we place a white with a reflectance of 68 per cent beside it. If we go a step further and use another panel painted with a white with a reflectance of 74 per cent, both of the other two white paints will appear gray.

Additional comparisons can be made with a panel reflecting 80 per cent. This is in the range of high-grade white finishes. But the paint chemist has gone still further. You can obtain a fine quality industrial enamel that will reflect 90 per cent of the light that falls upon it. By comparison, the other panels fall into their true relationship and it is quite evident that there is a vast difference between white paints, both as to their whiteness and their ability to reflect light.

There is general agreement that the reflectance of the walls should be lower than that of the ceiling. Various committees of the Illuminating Engineering Society have established limits for wall reflectance values in their recommendations. These limits vary somewhat but range between 50 and 70 per cent for upper walls. For the lower portion of the wall, a re-

flectance of one-half that of upper wall is suggested.

It was not intended that these reflectance limits should arbitrarily exclude all other values. They are intended to mark the boundaries of safe usage so that even the inexperienced could be assured of satisfactory results.

We would like to point out that limitations in allowable reflectance tend to restrict the user and may rule out certain very useful colors. Furthermore, these limitations are not easily reconciled with the stress now being placed on the use of lighter environments wherein lighter walls play a major role.

In studying this problem an analysis was made, Fig. 2, of the factors involved to try to establish a valid reason for reflectance limitations in a typical situation. The results were interesting and although they can hardly be said to set everything straight, they may serve some useful purpose.

We have taken, as an example, a working level illumination of 200 fc which for an average plant task having a reflectance of 30 per cent would develop a brightness of 60 footlamberts (fL) on the work surface. As a starting point, we might limit the wall brightness to be no more than three times or less than one-third of the brightness of the work. This would be a range of 20 fL minimum to 180 fL maximum.

With the work surface illumination of 200 fc, the illumination on the vertical wall could be estimated at 70 fc, which is between one-half and one-third the horizontal value. Then, if the reflectance of the wall is 50 per cent, its brightness would be 35 fL. If it reflects 70 per cent, its brightness would be 49 fL. Apparently either of these figures would be well within the prescribed 20 fL to 180 fL range.

Even an 80 per cent or 40 per cent wall should be entirely satisfactory. If we were willing to accept a brightness ratio of ten-to-one, instead of three-to-one, the allowable range of wall brightness would be still broader.

Suppose we are talking about an office where the work surface might have a reflectance of 70 per cent. Now, with 200 fc of illumination, the brightness of the work is 140 fL. At a ratio of three-to-one, or one-to-three, the allowable range for the wall is 47 to 420 fL. Once more, a wall reflectance of 70 per cent is satisfactory and it could be much higher. A 50 per cent wall is a little too dark.

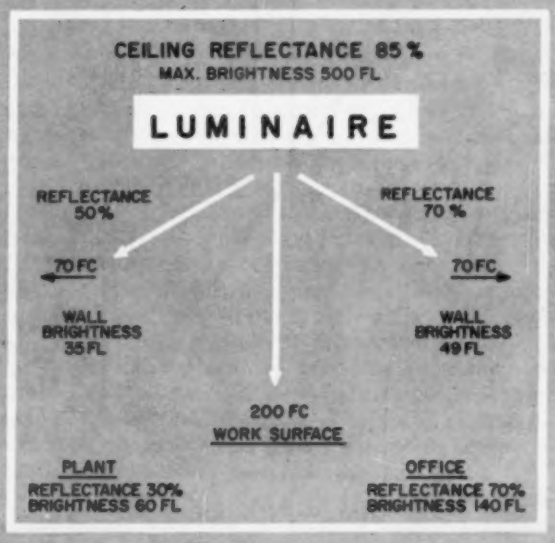
We have known for many years that a white paint of high light reflection value is essential to achieve maximum output from a modern lighting system. Whether the greater cost of such a paint, or for that matter, whether the cost of even the lowest priced white paint could be justified on the basis of savings in illumination has not always been clear. We were accustomed to think in terms of a better looking plant, protection of surfaces, employee benefits and other advantages.

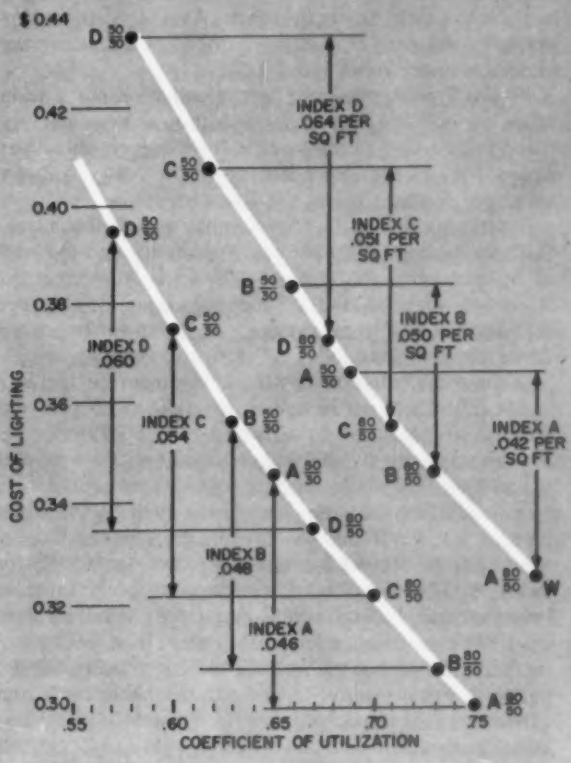
However, the new higher lighting levels have switched the economic balance to the other extreme. No longer is it a question of whether one can afford to paint the ceilings with a high-reflecting white, but rather, can one afford not to.

To illustrate this, Fig. 3, shows the cost range of a typical lighting job. The figures include purchase and installation of equipment as well as operating and main-

Fig. 2, below. Analysis of reflectance in a typical office or plant area and resultant effect on wall surface brightness.

Fig. 3, right. Cost of light analysis showing savings possible by using high reflectance paints on both walls and ceilings.





tenance on a 10 year basis. A power cost of $0.01 per kwhr and a two-shift operating schedule are assumed.

In addition to the obvious effect of labor and material rates, the cost of lighting varies with the type of luminaire, the dimensions of the building and with the reflectance value of the walls and ceilings. The measure of the efficiency of a given area or room, from the lighting standpoint, is expressed in the form of a percentage known as the coefficient of utilization.

The higher the coefficient, meaning more effective reflecting surfaces, the lower the cost of lighting. Tables of these coefficients are published by manufacturers for a wide variety of equipment, room sizes and conditions. We have made the assumption that the cost of lighting a given job may be estimated closely as a function of the coefficient of utilization.

On the graph, Fig. 3, two curves are shown representing the total cost per square foot per year to supply 100 fc of illumination. They represent two separate computations from different sources of information. They do not coincide and I have made no effort to reconcile them as we will see that it makes no difference which curve we use to obtain cost comparisons.

Size and Shape of Room Affect Cost

An important factor affecting the cost of lighting is the size and shape of the room. This factor is known as the room index. A large room with a high ceiling is catalogued under room index A, a smaller room under room index B and so on. The cost of lighting a large area such as room index A is less than, for example, the cost of lighting a room of smaller area, identified under room index D.

Figure 3 gives complete cost information for a wide range of building types and conditions. You will see that the cost of lighting sweeps from a high value per square foot, at the upper left, down the curve to a low value per square foot, at the lower right.

Take room index D, for example on the top curve. With the ceilings at 50 per cent reflectance and the wall at 30 per cent, the cost of 100 fc is $0.43 per sq ft. If we increase the ceiling reflectance to 80 per cent and the wall to 50 per cent, as shown further down curve under room index D, the cost is only $0.37.

Thus the savings in cost resulting from an increase in the reflectance of the ceiling from 50 to 80 per cent and the wall from 30 to 50 per cent is $0.064 per sq. ft. This is shown by the vertical line. For a 50 by 100 ft building, this would amount to $320 per year.

You will see that the savings for each of the room indexes, D, C, B and A, are all on the same order ranging from $0.064 for index D down to $0.042 for index A. Likewise, for the other completely separate investigation, shown by the lower curve, similar values exist. The savings under room index D is $0.06 per sq ft and through C, B and A, the latter being $0.046 per sq ft. For our purposes, we can use either curve and arrive at approximately the same figure for the savings in lighting costs.

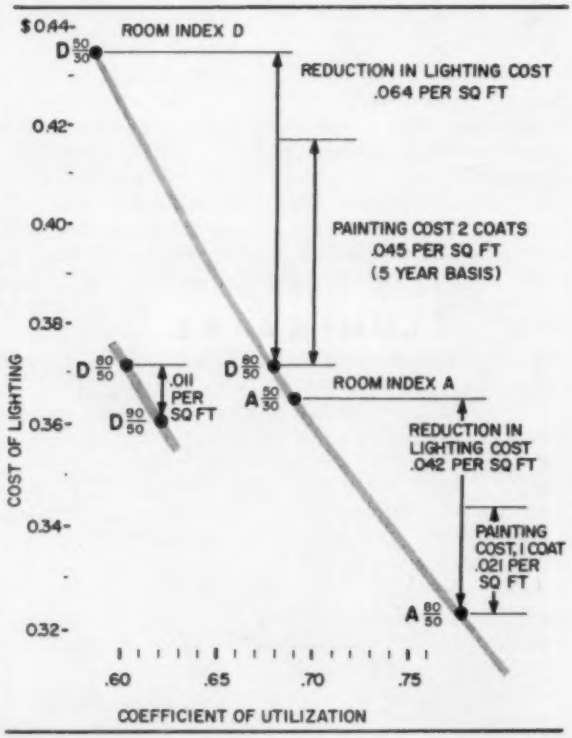
Summarizing, we can say that Fig. 3 shows that for a wide range of building shapes and areas, the cost of lighting is substantially reduced as we increase the reflection value of the ceilings and walls. The amount of this reduction is approximately the same even though the total estimated costs do not coincide.

If we now look at either one of the curves in more detail, Fig. 4, we can compare the savings in lighting costs with the annual cost for paint in a room of the proportions of room index D. The reduction in lighting cost is $0.064 per sq ft per year. A careful estimate of the cost of two coats of paint is $0.045 per sq ft. A high-grade two-coat paint job would actually produce a reflectance on the ceiling substantially higher than 80 per cent as outlined earlier when talking about the white panels, one of which reflected 90 per cent. We are assuming, however, that after painting, a gradual reduction in reflectance would result so that the average would be 80 per cent.

It is clear then that for an expenditure of $0.045 per sq ft, based on a life of five years, a resulting savings of $0.064 per sq ft in cost of light is made year after year. Obviously, there is no question as to whether one could afford to paint. It would cost him money in extra lighting cost every year he did not. In fact, the amount saved through painting walls and ceiling would pay the painting cost and leave a gain of 33-1/3 per cent.

Also consider room index A, Fig. 4. This is the large type of building commonly used in industrial plants where one coat of paint is usually used. The cost of painting one coat would be $0.021 per sq ft which compares with a saving of $0.042 per sq ft. **End**

Fig. 4. Comparing savings in lighting costs with annual cost of paint for rooms with proportions of room indexes A and D.



PRE-PLANNING for INDUSTRIAL EMERGENCIES and DISASTERS

By JOHN E. LOCKHART, Manager, Plant Engineering, Evendale Plant, General Electric Co.
JAMES A. DAVIS, Manager, Plant Security, Evendale Plant, General Electric Co.

Part III. What we learned—our weaknesses and our strengths—from experience in planning, training and drilling for emergencies.

OUR EVENDALE Plant has had a formal emergency program since 1953. The nature of our business, which involves some measure of extra protection against fire, and its importance to the defense effort, made a formal plan necessary.

The initial survey of the problem correctly established the objective of the program as "planning and organization to anticipate and correct emergencies affecting the plant whether arising from plant-contained, community, or national situations." Almost immediately cooperation with neighboring industry and with Civil Defense were added as being desirable and compatible.

In its earliest form the plan was well conceived as involving: definition of the scope of the problem; survey of resources; establishment of organization and definition of responsibilities; establishment of an Emergency Headquarters; procurement of equipment; formation of a mutual aid organization; management training exercises; training of volunteer emergency squads.

Organizational Experience

Our early inventory of resources indicated that the maintenance and construction stores required for normal plant operation were all that we could justify keeping on hand. Some very limited experiments with special stocks of heavy tools such as sledge hammers, wrecking bars, etc., confirmed our opinion that these would soon become too much trouble to maintain and control, and our low opinion of their value has remained unchanged.

Early surveys of our degree of exposure to certain risks resulted in the purchase of an extra fire truck, the installation of several battery-type emergency lights and exit lights, somewhat better maintenance and supervision of storm water pumps, and several other minor type improvements in our normal operations.

We long ago found it advisable to have two hundred folding cots on hand, with blankets, etc., and to maintain a two-weeks' supply of food in the cafeteria pantry, for an established number of key personnel. Recently we have decided that a normal plant, well equipped to take care of itself through the routine small emergencies the plant engineer is accustomed to handling each week, and which has good fire protection and internal and external utility service, cannot justify more than a few cots, a little food, a safe and dependable water supply, and some good independent communications equipment as emergency supplies.

If this equipment is adequately protected from radioactive fallout, and some radiological monitoring equipment is obtained, the plant will have done all it can reasonably be expected to do, in our opinion, in the way of material resources.

In addition to the above, we have selected an underground room near the center of the plant for an emergency headquarters. It is quite simply appointed, having only a few desks, chairs, telephones, maps, drawings, etc. A large layout of the plant, and a large aerial photograph on the wall complete the furnishings. An emergency power supply of five kilowatts for this room alone is currently planned.

This particular room was selected because of nearness to tunnel intersections which make it accessible under almost any condition except complete destruction of the building. In addition, the 15-in. reinforced concrete floor above gives the room all the protection we consider feasible. Today it is important, when considering potential enemy attack, that we recognize that absolute protection is virtually impossible, so we therefore select the best protection available to us and make the utmost use of it.

An emergency organization, headed by one administrator, was established and the administrator initiated a training program. In retrospect, the early organization and early training programs were the least effective of our efforts. It appears to us now that our mistakes were:

1. Establishment of an administrator outside the normal operating organization to both organize and

administer the program. The administrator did an effective organizing job, but he was given responsibility for carrying out the program without any effective operating tools. Planning for emergency and operation in event of emergency is now a part of the responsibility of normal plant management, with the administrator coordinating the planning, the training, and the actual operations efforts if an emergency should occur.

2. An assumption that upper management should take over, make decisions, and operate the plan in event of actual emergency. Experience has established that top management does not intend to take over activities which may be completely foreign, but instead expects normal operating management to carry on as usual, keeping top management informed and requesting help where required.

3. Coordinated, rather than group, training programs were attempted. It was found impractical to get top management participation in long training sessions, and training at lower levels initially consisted of the administrator working individually with managers in each area. It has now proved more effective to use groups of operating managers by developing a problem, calling the group together under simulated emergency conditions and presenting the problem. The group's solutions usually result in a better understanding of the scope of the problem, its practical considerations, and an increased awareness of the importance of planning.

Mutual Aid Organization

One of the early achievements of the program was the organization of the Evendale Industrial Mutual Aid Organization, although fortunately it has never been called upon to go into action. Evendale is a small incorporated village just north of Cincinnati. Although small, it contains a significant concentration of industrial plants, large and small, independent plants, as well as branches of several large corporations.

In addition to the industrial plants are warehouses, trucking depots, railroads, and a school for deaf children. The following declaration describes the organization much better than any other description could:

"The Evendale Industrial Mutual Aid Organization has been organized to provide more adequate protection for the participating industries in the event of disaster caused by fire, explosion, tornado, flood, industrial accident, and for enemy attack.

"The officers and committee of this organization will make a continuous effort to educate and train its members in the latest theories on industrial disaster controls so they may keep their respective managements advised on the proper methods of operation for maximum protection of their personnel, plant and facilities.

"This organization is dedicated to prevent disaster when possible, control and eliminate when necessary and assist in the restoration of plant and facilities after disaster strikes to guarantee continued production of the Evendale industrial plants.

"They will integrate their operating forces with the Cincinnati-Hamilton County Civil Defense Organization for over-all control and coordination of disaster control forces for maximum industrial plant protection during emergency conditions affecting Hamilton County."

The Evendale Industrial Mutual Aid Organization is merely an agreement to assist each other as much as feasible in an emergency. It is a good example of making use of available resources. The system is adequately tied together with radio and telephone, and some consideration is now being given to tying in some other nearby communities through the county police radio network.

The Evendale organization has never been called upon. However, in at least one instance, a prompt call upon it by a neighboring community would probably have saved several hundred thousand dollars of damage to a nearby industrial plant. Fully forty-five minutes elapsed before an Evendale organization member realized the neighbor plant was in trouble and lacked water which the Evendale plant had in more than adequate supply.

As an aside, it is worth noting that the very start of the fire destroyed the neighboring plant's telephone communications, leaving it unable to call the fire department; this circumstance also contributed much to the damage. Telephone communication cannot be relied upon in community-wide disasters either; our exchange was completely blocked for more than an hour during a flood late last winter.

Lou Metz, Emergency Administrator, outlines a problem to the emergency staff. Metz administers the program of developing problems, training volunteer emergency squads, keeping the emergency staff active, maintaining the facilities and communication system, performing liaison with Mutual Aid and Civil Defense. Staff members of the emergency staff are responsible for conditions in own areas.

We believe the essentials of a Mutual Aid Organization are: Clear understanding of purpose and procedure; effective communications; frequent regular meetings; early alerting even if no call for help follows; calls for help while help can be effective.

It is probable that several separate, small, closely-knit organizations are better than one large cumbersome organization, but there should be advantages to a tie-in of the several small units. Our studies indicate that the broad tie-in of several communities may be of greatest assistance in preventing complete tie-ups of emergency equipment by traffic. In one exercise, the several communities near us were able to keep one main traffic route clear for fifteen minutes.

Civil Defense Exercises

The Evendale Plant Emergency Organization has participated in two major Civil Defense exercises, Operation Alert—1956 and Operation Alert—1957. From each of these much has been learned about organizational problems, general emergency problems, and the possible problems arising from enemy attack.

OPAL - 56. This exercise was designed principally as a test of communications and of organizational effectiveness of the plant emergency organization, of Mutual Aid, and of both in cooperation with the Ohio Valley Civil Defense Authority.

It involved the evacuation of emergency equipment such as fire trucks, ambulances, and police cars to an area outside the "target" area, a demonstration by a U. S. Army Unexploded Bomb Disposal Squad, and some experiments in traffic control.

Within the plant emergency organization this exercise proved to us that placing all activities at the disposal of the administrator was not overly successful, as the administrator soon would become overloaded with the many problems.

It was decided that emergency operations were a part of the responsibilities of normal operating management, and that the administrator would be much more successful if he presented the problem to the normal managers and depended upon them to carry on, while furnishing them communications and liaison.

In spite of the handicap of too much undelegated responsibility, the administrator carried off the entire operation quite effectively because of the intensive preparation and planning he had already performed.

The external activities were also carried out with only minor discrepancies. The emergency equipment evacuated on schedule and rendezvoused on schedule. Communications by radio worked very well.

Traffic control on the highways worked much better than had been expected. This gave rise to some conviction on our part that if an evacuation were ever to be desirable, it could be carried out successfully if the proper planning and organization could be performed ahead of time.

The importance of informing all interested or potentially interested parties and organizations of such exercises was pointed up by the fact that another police department not fully informed, assumed the exercise was the real thing and very successfully established road blocks to divert traffic from the area, much to the disgruntlement of some citizens and, of course, the uninformed police.

Huge tank of heavy oils is ignited and then extinguished by dry chemical units handled by Fire and Salvage Squads.

OPAL - 57. This exercise was for us a paper exercise, meaning that there was no physical evidence of an exercise, merely a meeting of active participants in the emergency plan. The exercise was designed to test the capability of industry, Civil Defense, and the Air Defense Command to operate together.

At 11 A.M. the Air Defense Command notified all key points of a positive sighting and that Cincinnati could come under attack within three hours. It was assumed that there had been a buildup of tension to the point where Civil Defense had evacuated the city a few days earlier, and that only key personnel were in the city and the plant. In the three hours from 11 A.M. to 2 P.M., Civil Defense and our emergency chief were active in some exercises concerned with preparations for an attack.

At 4 P.M. the Plant Emergency Task Force was called together and informed of the situation which was:

> "A five megaton bomb had burst some five miles directly south of our plant. Since our plant is over a mile from north to south, we would suffer damage varying from destruction at the south end, mostly from fires from roofs and fuel tanks, to only severe damage at the north end of the plant.
>
> "It had been decided to sacrifice several buildings at the south end in order to save those at the north end, where we had several small fires under control. Power was gone, but previous study with the power company indicated that under any conceivable attack power would be restored in thirty-six hours.
>
> "The north utilities plant was still in operation, although some areas would be without service until piping damage was corrected. Water would

(Continued on page 148)

CORROSION meets its match in Alcoa aluminum conduit

Here's an electrical rigid conduit that you can install and forget.

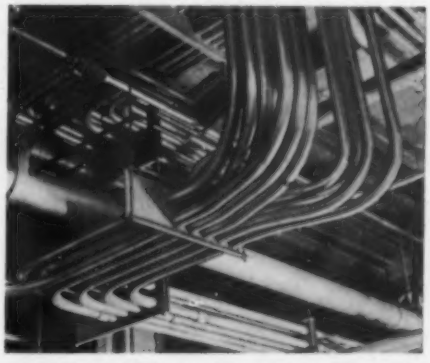
Alcoa aluminum conduit solves most corrosion problems in and around chemical plants.

Aluminum protects itself Unlike other conduits, which require some kind of coating, aluminum forms its own protective film. This film forms naturally in the atmosphere and in the presence of oxidizing agents. Damaged spots are self-repairing—almost instantly! The natural oxide coating on aluminum takes the place of factory coatings on conventional conduits and only under unusual conditions is any other protection required.

Other advantages Corrosion resistance is just one good reason for selecting aluminum conduit. Its light weight (about ⅓ as much as steel) makes it easier to handle and install. Alcoa aluminum conduit is also nonmagnetic and non-sparking.

How about cost? Consider initial cost, savings in installation and maintenance, and service life. You'll see that Alcoa aluminum electrical rigid conduit stacks up as a sound investment.

More information For specifications, or answers to specific questions about the use of aluminum conduit in corrosive environments, contact one of our nearby representatives. Or write to Rome Cable Division of Alcoa, Dept. 5-70, Rome, New York.



NO CORROSION despite moisture, chemicals and vapors in the basement of this sewage disposal plant in Cleveland. Installed in 1932, this Alcoa conduit still looks almost like new.

ROME CABLE
DIVISION OF **ALCOA**

For more facts circle 565 on Reply Card

not be a problem since our own wells could be operated when power was restored. Natural gas situation was unknown, but it could be presumed that it would be unavailable for some time."

Of course the question the Air Force wanted answered was, "What can you ship, and when, and what are your limiting items?" It was a genuine pleasure to watch the effectiveness with which the production superintendents, the production control personnel, and the purchasing personnel attacked this problem. They asked numerous questions about damage to certain equipment, the ability to make or alter other equipment, and in a few hours were able to give the Air Force a reasonable reply which would undoubtedly pose some genuine problems, and realistic ones, for the Air Force planning personnel. Officially, at that point, our exercise was completed.

However, most of the real learning from these problems comes later, perhaps even months later. We have never experienced anything but dead serious cooperation at one of the exercises, and the questions asked have always resulted in our learning something more about our plant and the problems which might arise. Note that we say "might arise" instead of "could arise," since we are only interested in those which might be reasonably expected to arise, in preference to the freak problem which we neither expect nor would know what to do about if it did happen.

After OPAL 57, we began to ask ourselves:

1. Although we have quite successfully evaluated our situation, the Air Force would have to review many similar reports before they could arrive at a decision as to whether or not it was worthwhile to the defense effort for us to continue production.

One broken link in the chain of companies supplying parts for an airplane could make all the rest useless for some time. Were we justified in expending critical materials in rehabilitation until a decision was available to us?

2. With many thousands around us homeless and hurt, was it not reasonable to assume that the problem of caring for them would be our first responsibility?

3. Were we not completely overlooking the fallout problem which might well make rehabilitation, or even emergency activities, completely impossible? Could we actually have done the firefighting, or even the damage inspection, under fallout conditions, that our problem had assumed?

Could we exist in our basement headquarters until outside radiation reached a safe level for evacuation?

Our answers to these questions are quite simple:

1. To 1 and 2, we must use any resources at our disposal to help the community, in the absence of specific instructions to the contrary from the Armed Services.

2. The answer to 3 can be arrived at only by the use of radiation measuring instruments at the time, but we had not given this problem the consideration it deserves.

3. To question 4, we *must* survive, so we must take all reasonable precautions to make survival possible. Study indicated that drinking water supply was the first anticipated limitation upon our ability to survive.

OPALS 56 an 57, we feel, gave us some sound experience on which to continue our program. From these experiences we are convinced that the absolute essentials of a complete program are:

1. A plan and a program based upon sound understanding of objectives and potential problems
2. Some type of headquarters equipped with adequate and reliable communications
3. Possession of and familiarity with the use of some type of radiation measuring equipment
4. Availability of some type and quantity of food and safe drinking water
5. Some consistent training program

It appears to us that achieving the above will often be worth the investment of money. Over and above this, it is probably best to just be grateful for whatever you may have available.

As an example, when discussing the supply of potable water, it was discovered that one of the plant's six unused wells had been equipped with a gasoline drive when constructed by another firm during World War II (and only recently acquired by us). Rehabilitation, at small cost, of this drive gave us an emergency water supply safe from radioactive fallout or power failure. On the other hand, we are aware of, but do not yet see a solution to the problem of getting coal from the yard to a boiler under severe fallout conditions. However, this will be considered if an improvement to the present conveyor and bulldozer method is ever required. Somewhat in reverse, some two-way radios purchased for the emergency program have paid for themselves on utility shutdowns when each crew is given a radio. The time consumed in switching, opening and closing valves, and obtaining needed material or assistance has been greatly reduced.

Volunteer Fire Squads

One of our most helpful programs is the training of volunteer fire squads. These squads are made up of volunteers employed in certain areas of the plant. The training consists of instruction by movie and demonstration of the various types of fires and the proper extinguishing equipment.

This is followed up by actual use of various types of extinguishing equipment on actual fires set in a small area in the plant. There is no substitute for the actual experience of laying a hose, handling a fog nozzle, or of the frustration when an extinguisher is not properly directed at the base of the fire.

The enthusiasm and effectiveness of the squads are also considerably increased by the actual use of equipment. An annual competition with squads vying to see which can extinguish a certain fire in the shortest time is well attended and always productive of a lot of serious competition as well as some general good humor and a few laughs at the expense of those who have trouble.

To date, few calls upon these volunteers have been made, but results in those instances have been most successful. Of course, an excellent by-product of this training is a much improved attitude toward fire prevention in areas where fire squads have been established and trained. **End of Series**

Central Indiana: Past presidents of chapter who received lapel pins are, l to r: S. R. O'Haver, W. Roberts, J. Keys, P. Simmonds, W. Klein and G. Schulz.

PLANT ENGINEERS ACTIVITIES

HERE ARE A few highlights of events taking place at meetings of various Plant Engineers Clubs around the country.

Central Indiana

The annual "Ladies Night" of the Central Indiana Chapter, held at the Marott Hotel, Indianapolis, was both interesting and highly entertaining. Members and guests were treated to an interesting talk along with color slides of a "Raft Trip Down the Colorado River."

One highlight of this meeting was the presentation of AIPE Lapel pins to all of the past presidents of the chapter. Past presidents receiving the pins were: G. Schulz, Citizens Gas and Coke Utility (1953-1954); W. Klein, Firestone Industrial Products (1954-1955); P. J. Simmonds, International Harvester Co. (1955-1956); J. K. Keys, Indianapolis Power and Light Co. (1956-1957); S. R. O'Haver, International Harvester Co. (1957-1958); and W. O. Roberts, Bridgeport Brass Co. (1958-1959).

(Please turn page)

Phoenix: Chapter officers are, l to r: D. Cravener, vice president; L. Nielson, president; W. C. Wallin, national president of AIPE (with Western Electric Co., Winston-Salem, N. C.); C. Gort, secretary; and A. Swindler, treasurer. Phoenix was accepted as Chapter 51 at the January Executive Committee meeting.

Pittsburgh: AIPE past vice president Bob McCaw, left, and past president Bob Hiller at March meeting. Note the chapter banner in the foreground.

Joint Meeting—Los Angeles, Orange County, Rose Bowl: L to r are: D. Daley, Rose Bowl; C. Gallaher, West Coast regional vice president; T. Woodworth, Orange County; J. Weeks, AIPE vice president; W. Wallin, AIPE president; and M. Bolzer, Los Angeles. Total attendance 56.

Dayton: Dick Morris recently visited the Dayton Chapter and discussed some of the EJC activities. L to R are: E. Weisser, secretary-treasurer; Dick Morris, Plant Engineering magazine; R. Loeb, vice president; C. Theodore, president. A regional AIPE meeting is being considered.

Phoenix

National President W. C. Wallin was on hand at a recent meeting of the Phoenix Chapter to present their charter and offer congratulations to the new members. His talk on the purposes and future plans of the AIPE, including various seminar activities at national and local levels, was followed by a lively question and answer period.

Phoenix Chapter officers are: L. Nielson, AiResearch Co., president; D. Cravener, Jr., Reynolds Metals Co., vice president; C. Gort, Sperry Phoenix Co., secretary; and A. Swindler, Goodyear Aircraft Corp., treasurer.

Pittsburgh

Members and guests of the Pittsburgh Chapter attending the March meeting heard an interesting talk by Robert W. Tobey of the Trane Company. He discussed industrial air conditioning and presented some enlightening facts on the first cost and operating costs of different systems for both old and new buildings.

Pittsburgh joins the Mohawk-Hudson Chapter in adopting a chapter banner and displaying it at all the meetings. A glimpse of it can be seen in the Pittsburgh illustration appearing on these pages. The Institute symbol, designed by Bob Hiller, second president of the AIPE, is in the center of the banner.

Joint Meeting

Members of Los Angeles, Orange County and Rose Bowl Chapters attended a joint meeting held at the Roger Young Auditorium in Los Angeles. The speaker of the evening was Bill Wallin, AIPE National President, who presented the charter to the Rose Bowl Chapter.

The members from the three chapters enjoyed this type of meeting very much, and they are planning to have similar get-togethers in the future.

EJC Activities

Dr. York was the guest speaker at the Annual Meeting of the Engineers Joint Council which was held in New York City. Dr. York is Director of Defense Research and Development of Defense. He discussed the rocket progress in this country and compared it to that of the Soviet Union.

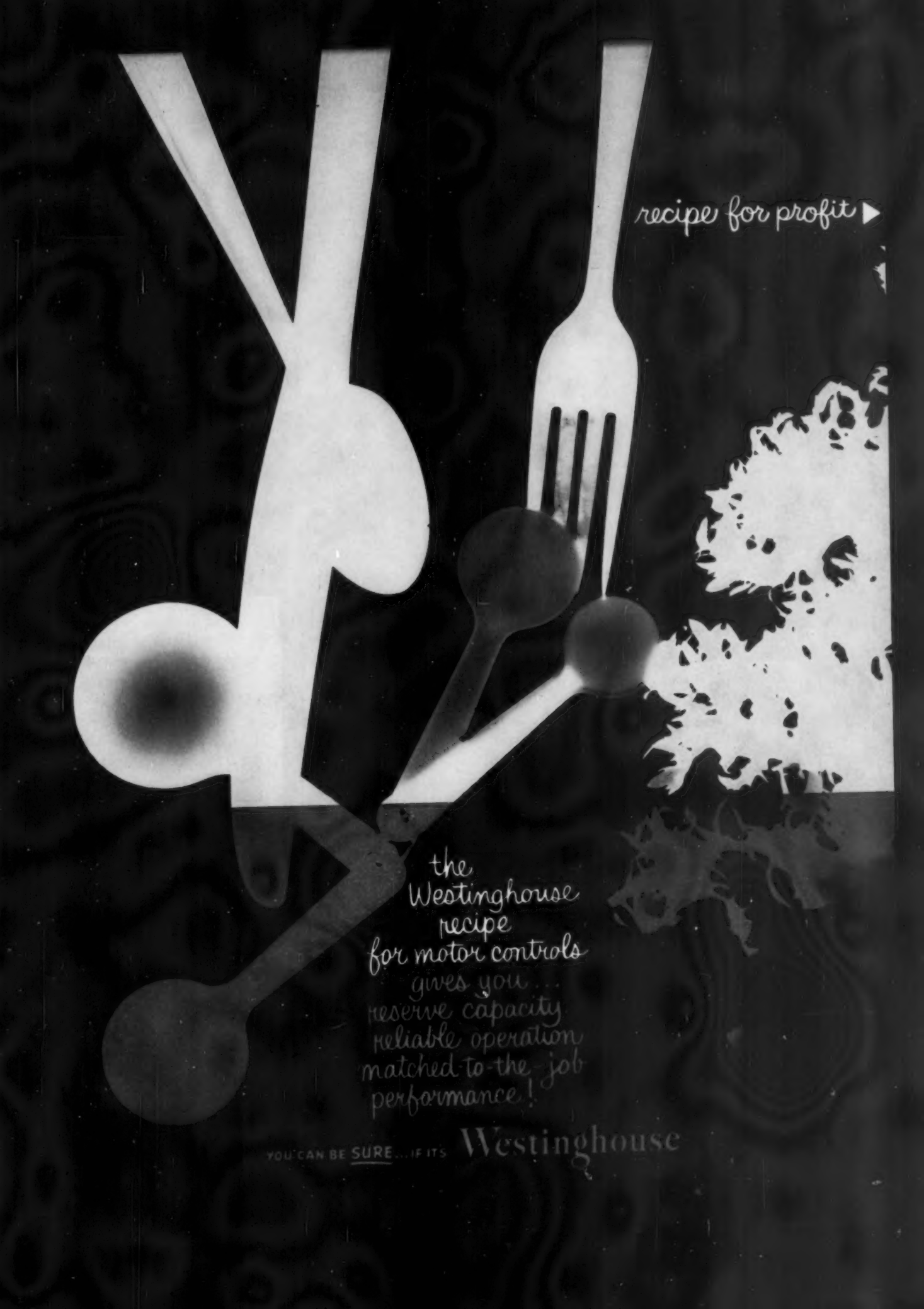
The American Institute of Plant Engineers, which is a member of the EJC, was represented at this meeting by Dick Morris.

On the previous evening at the Presidents Dinner, the AIPE was represented by President Bill Wallin, (of Western Electric Co., Winston-Salem, N. C.), and President-elect Fred Fryberger (of Food Machinery and Chemical Corp., Baltimore, Md.).

The Presidents Dinner was instituted last year by Enoch Needles, at that time President of the Engineers Joint Council, as a means of fostering cooperation between engineering societies through closer contact of society officials. **End**

EJC Meeting: Dr. York at left, discusses final details of his talk prior to the Annual Meeting with EJC President G. Kinzel and retiring president E. Needles.

For more facts circle 566 on Reply Card ⟶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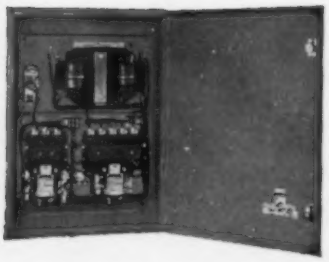

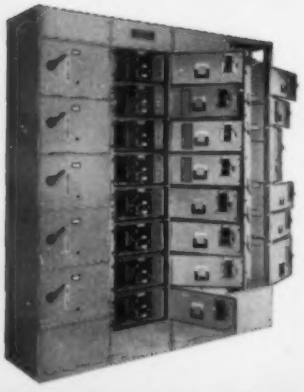

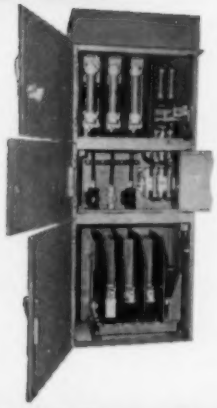

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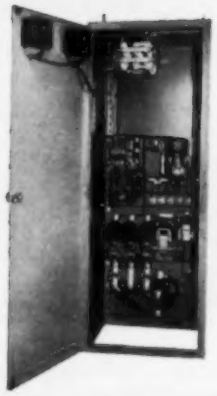

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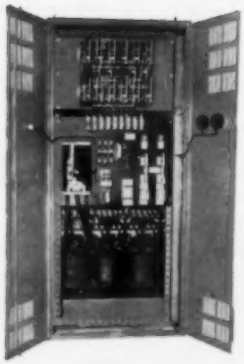

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HOW TO DESIGN

PNEUMATIC-HYDRAULIC ACTUATION SYSTEMS

EIGHTH IN A SERIES OF ARTICLES

Part VIII. Designing a pneumatic system for workpiece movement, using hydraulic control

IN MOVING a workpiece from one station to another by pneumatic means it is often desirable to use a hydraulic buffer.

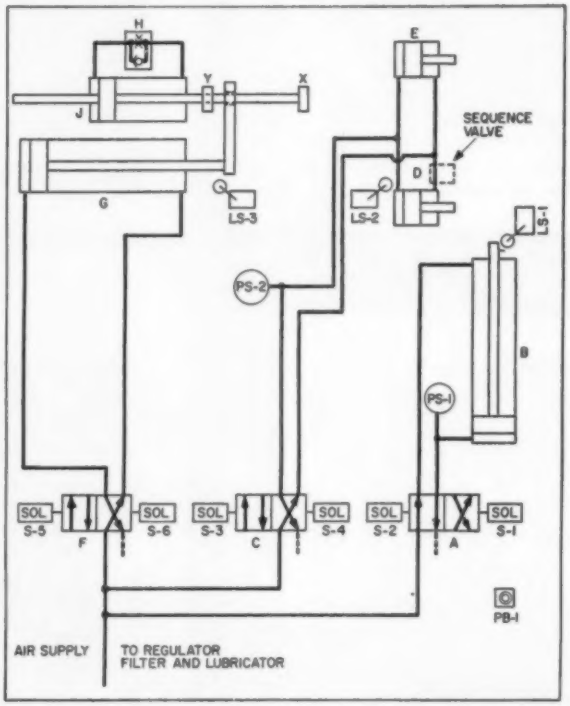
In Fig. 1, we have a circuit which is semi-automatic in nature but can be changed over to automatic by adding one more limit switch. This basic circuit could be applied to a number of applications of moving a workpiece. As illustrated it pertains to a cut-off application where a length of material is cut several times into smaller pieces.

The heart of the circuit is the air cylinder that is hydraulically controlled. To start the circuit in operation the operator momentarily depresses pushbutton PB-1 which energizes solenoid S-1 of valve A; the spool is shifted and air pressure is directed to blind end of loading cylinder B. When the workpiece is pushed against the work stop, pressure builds up in line between A and blind end of cylinder B closing contacts of PS-1. This energizes solenoid S-3 of valve C. Spool of valve C shifts and air pressure is directed to the blind ends of cylinders D and E and workpiece is clamped. Air pressure builds up in line between valve C and blind ends of cylinder D and E. Contacts in PS-2 closes energizing solenoid S-2 of valve A and air pressure is directed to rod end of cylinder B and piston retracts releasing pressure on end of workpiece.

As piston of cylinder B nears the retracted position, cam on end of rod momentarily trips roller of LS-1 and solenoid S-5 is momentarily energized. Air pressure is directed to the blind end of cylinder G and piston starts to advance the table containing the workpiece at high speed and moves at high speed until arm on piston rod of cylinder G contacts collar X on rod of closed circuit oil cylinder J. Speed is then controlled by flow control H as the workpiece moves into the saw.

As the saw cut is finished a trip on the table contacts LS-2; solenoid S-6 of valve F is momentarily energized and air pressure is directed to rod end of G and piston of cylinder G retracts rapidly. When rod of cylinder G

Fig. 1. Control H affects rate of travel of buffer piston.



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PIGMENTS, PASTES AND POWDERS

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contacts collar Y, piston of cylinder G still moves rapidly as oil in back end of cylinder J flows freely through check in valve H. LS-3 is tripped energizing solenoid S-4 of cylinder C and air pressure is directed to rod end of clamp cylinders D and E and workpiece is released. After short workpiece is released it drops into a chute as the table retracts. When piston of G reaches the retracted position the cycle is completed. If a continuous cycle is desired a limit switch can be tripped by the table just before it reaches the retracted position. This limit switch would be hooked up in conjunction with S-1 and could be in series with PB-1. All limit switches except LS-2 should be set up so that they can only be actuated in one direction or the cams should be of the swing type.

If in the application there would be a possibility of a jam or for any reason there would be a quick pressure buildup before the workpiece contacted the stop, it would be well to eliminate pressure switch PS-1 and use another limit switch which would be actuated as workpiece reached the work stop. This would eliminate the possibility of the clamp cylinders closing before the workpiece contacted the stop.

If it is desirable that one clamp cylinder should open ahead of the other, then a sequence valve could be placed in the line between D and E as shown in dotted lines if piston of E is to retract first.

The collars on the piston rod of cylinder J are adjustable so that the workpiece can be advanced rapidly until it is ready to contact the tool then the fine feed takes over. The adjustable collars also provide settings for different size workpieces. The collar arrangement can also be used when there is a tool operation at both ends of the stroke. The flow control valve H would be replaced by a variable orifice valve such as a needle valve. When piston of cylinder G advances, collar X will control the speed for a portion of the outstroke and when piston of cylinder G retracts collar Y will control the speed for a portion of the instroke. This would work fine where workpieces are loaded on both ends of a table.

Circuit in Fig. 2 is used for moving a workpiece in which two air-oil tanks are used. If you will remember article No. 7, we showed a photo and circuit of an air hoist that was oil-controlled but in that circuit we had oil on one side of the piston and air on the other side. Here we have oil on both sides of the piston. In this application the workpiece is placed in air operated vise J. Note that the lines to the vise are in the hollow piston rod of cylinder H. This is advantageous on applications where the hose at the clamp point may be objectionable. This keeps the hose away from the work area. For instance a hose flopping around may be cut off by a saw or damaged by some object. A broken air hose can be dangerous to the operator. When hoses are necessary and are subjected to adverse conditions, it is recommended that wire-braided ones be installed.

In Fig. 2 the operator shifts handle of valve B directing air to blind end of clamp cylinder and workpiece is securely clamped. Operator then shifts handle of four-way three-position spring-centered valve A to position 2. In neutral position the inlet is blocked and

Fig. 2. Air lines are routed inside piston rod of cylinder H.

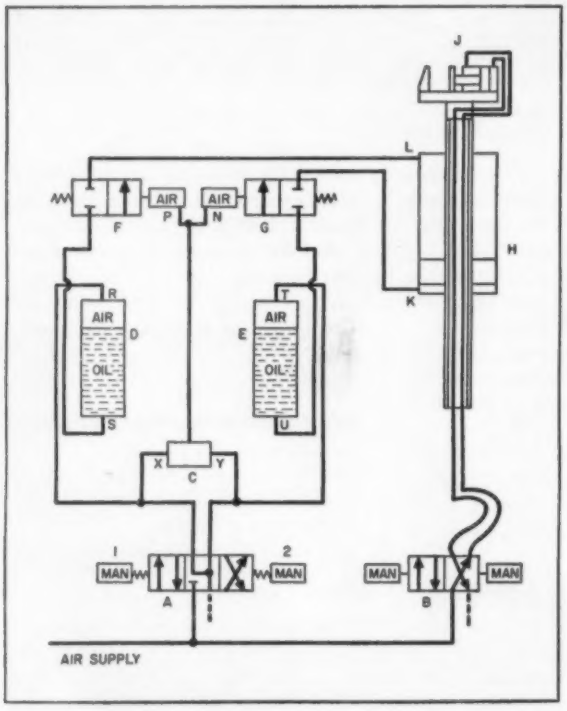
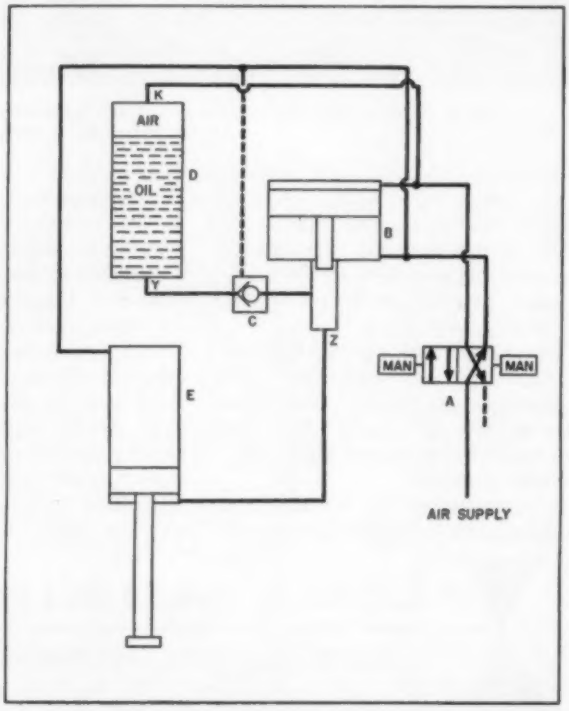


Fig. 3. This type of system can be used for pulling bearings.



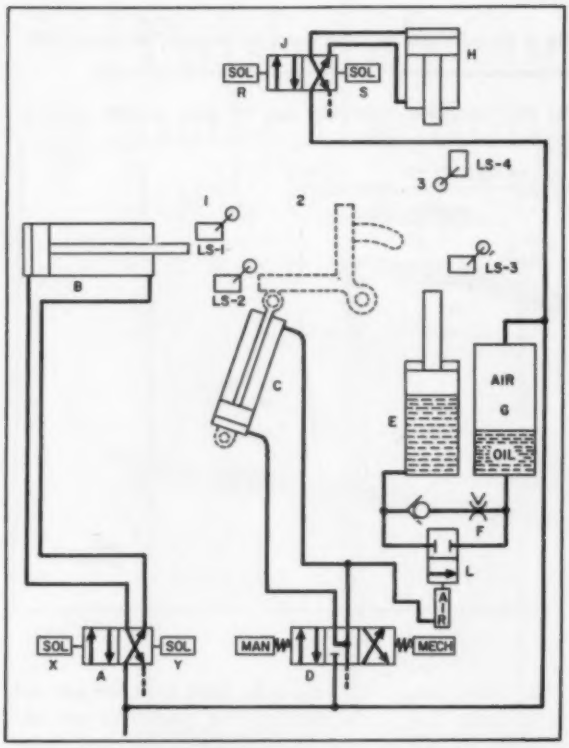


Fig. 4. Tilt table speed is controlled by orifice in Valve F.

lines are open to the exhaust. Air pressure is directed to port T of air-oil tank E and to port Y of shuttle valve C. Air pressure flows from shuttle valve to port P of two-way valve F and port N of two-way valve G. This opens the passages through valves F and G.

Air pressure entering tank E forces oil out port U and through now open valve G then on to port K of cylinder H and piston starts to advance as oil is forced out of port L then through open valve F into port S of air-oil tank D. Air is exhausted out port R and then through valve A.

At any time the operator releases the handle of valve A, passages in F and G close and there is a solid bank of oil on each side of the piston of cylinder H. The piston stop will be positive and the speed will be smooth. If flow control is desired on the outstroke, a flow control valve can be located in line between port L of cylinder H and valve F. The operator can stop the piston at any point during the outstroke or instroke of the piston. A circuit similar to this performs well for stacking applications where a circuit could use an electrically operated valve at A and limit switches would control the stops.

We have another example in Fig. 3 showing how a combination of air and oil can move a workpiece. Here we make use of an air-oil intensifier and air-oil actuated cylinder. This circuit can be used for pulling bearings, pull-broaching, and other applications requiring high initial starting force and low finishing force.

In using this circuit for pulling bearings, the operator, when piston rod of E is extended through bearing, connects pullplate onto end of piston rod and shifts handle of four-way valve A directing air pressure to blind end of intensifier cylinder B and to connection K of air-oil tank D. Since the ratio between the area of the piston and the area of the rod of intensifier B is 30 to 1 and if the air-line pressure is 100 psi the theoretical oil pressure coming out of the intensifier will be 3000 psi. This pressure flows to rod end of cylinder E and piston of cylinder E starts to retract as piston of B advances.

When piston of B has reached the end of the stroke and the bearing has been loosened, air pressure against the oil in tank D forces oil at 100 psi out port Y and through check valve C into intensifier chamber. Oil pressure at 100 psi moves out port Z into rod end of cylinder E and instroke is completed. It is important that the intensifier produce enough high pressure fluid to move the bearing until it is loosened otherwise the low pressure oil will not be able to finish instroke.

To advance the piston of cylinder E and retract the piston of B, operator shifts handle of valve A directing air pressure to blind end of cylinder E, to rod end of B and to pilot connection of C. Pilot pressure opens check C and oil as it exhausts from rod end of cylinder E keeps intensifier chamber full of oil and remainder of oil is forced back into tank D. It is necessary that D be large enough so that at no time will it ever be emptied of oil as it would cause erratic action of the cylinder. Another air-oil tank could be added to this system if it were desirable to have oil on the blind end of cylinder E but in a pulling application of this type it would not be required.

In Fig. 4, we suggested an air-oil circuit for handling large coils of strip steel weighing several thousand pounds. The air-oil circuit shown has a lot of merit. The roll of coiled strip moves down to station 1 where LS-1 is contacted and solenoid X of valve A is energized directing air pressure to blind end of cylinder B and piston advances moving coil onto turnover device at station 2. Just as piston B completes outstroke, LS-2 is tripped and piston of cylinder B is retracted.

Operation With Air-Oil Circuit

Operator shifts handle of three-position four-way valve D directing air pressure to blind end of heavy duty mill type air cylinder C and piston starts to advance, tilting table. As table approaches a center point an arm on the table contacts piston rod of oil cylinder E and as table passes center point a mechanical device centers spool of valve D and inlet is blocked and both cylinder ports are connected to the exhaust. The speed of the table is then controlled by the setting of orifice in valve F. When table has moved through a 90 deg arc, LS-3 is momentarily tripped.

This momentarily energizes solenoid R and air pressure is directed to blind end of cylinder H and coil is moved to station 3. As it approaches station 3, LS-4 is tripped and solenoid S is energized. Air pressure is directed to rod end of H and piston of cylinder H retracts. Operator then shifts handle of valve D; air pressure is directed to rod end of cylinder C and to pilot connection of two-way valve L. This opens passage between E and tank G.

(Please turn page)

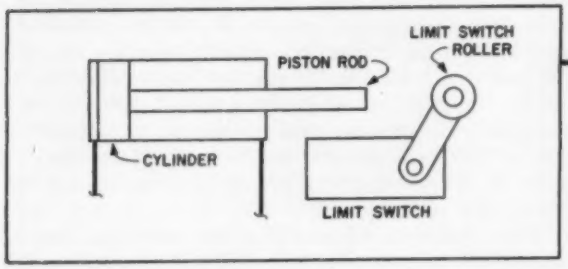
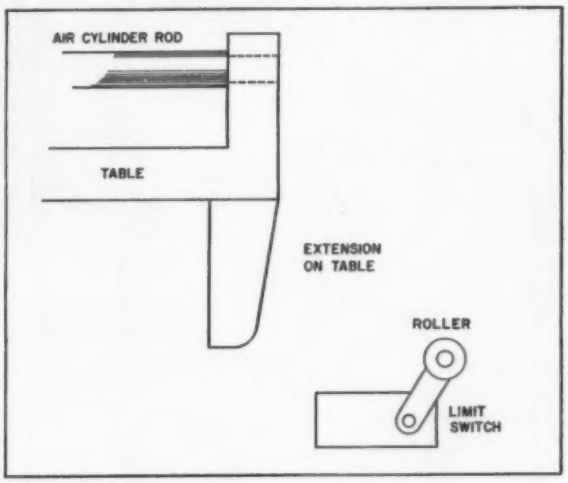


Fig. 5. In such a setup switch can be damaged by piston rod.

Fig. 6. Extension on table, not on arm, avoids trouble.



PNEUMATIC–HYDRAULIC SYSTEMS

As table is retracted piston in cylinder E advances completing the cycle. In line between F and tank G a decelerating valve can be located if an extremely heavy load is encountered. The load will be let down gently. Precautions must be taken for the heavier loads. Light loads could be handled without hydraulic help. For rollover applications or for heavy bearing loads use cylinders with long rod bearings.

Rollover problems may also be solved by the use of pneumatic actuators controlled by a hydraulic checking mechanism. The actuator operates a gear connected to the rollover device. The actuator may be any of several designs now available.

In this article series a number of electric valves controlled by limit switches have been shown. You probably have heard that limit switches may be the source of your trouble. However, did you ever think that it may be the fault of the user as to how he installed them? Let us consider some factors which cause these failures.

1. Limit switches will fail if they are used as a mechanical stop. Too often one will see a limit switch installed as shown in Fig. 5. The delicate mechanism of the limit switch must bear the brunt of the cylinder force if the valve does not reverse in time to direct air flow to the opposite end of the cylinder. Even though most limit switches are designed for some overtravel a fast moving ram may move beyond that point before the reverse flow can take over.

If a direct contact must be made, provide for a mechanical stop and eliminate damage to the contacts and mechanism of the switch. If a workpiece is to be used to trip the limit switch, make certain that it has no adverse effects on the switch. A workpiece with rough or irregular edges can soon ruin the switch. Also keep the operators from hitting the actuating mechanism with a hammer or any other device as this is a sure way to cause trouble.

2. Too often we see makeshift actuating arms connected to limit switches. Limit switches are designed to carry the actuating arm that they are equipped with and not some gadget that is placed on actuating arm as an afterthought in order to make contact with some machine part. If any additions are to be made, make them on the machine part as shown in Fig. 6. Extra weight on the actuating arm may be enough to keep the switch from resetting or it may cause the switch to trip prematurely. The added leverage may cause failure of the contacts.

3. Many times we hear that limit switches are not functioning but upon investigation find they are not actually tripped or that the contact time is too short.

Where vibration is present or where high cycling is encountered, one often finds that the cam or actuator is shaken loose or worn just enough to keep the contacts on a normally open limit switch from closing or a normally closed switch from opening.

In instances where there is a possibility of excess wear occurring, the trips should be designed to compensate for wear and should be made of a wear resistant material. The tripping mechanism should be securely installed. Often it is advisable to dowel the base of the tripping mechanism.

Generally it takes about two-tenths of a second for a limit switch to actuate a solenoid valve. This should be taken into consideration when designing the circuit.

4. Caution should be used in choosing the design of cams or tripping mechanisms. The actuator of the switch should not be hit abruptly by the tripping mechanism as this will cause considerable mechanical wear. The cams should have smooth, rounded edges and the rise on the cam should be gradual. Abrupt acting cams can also bend the actuator of the switch.

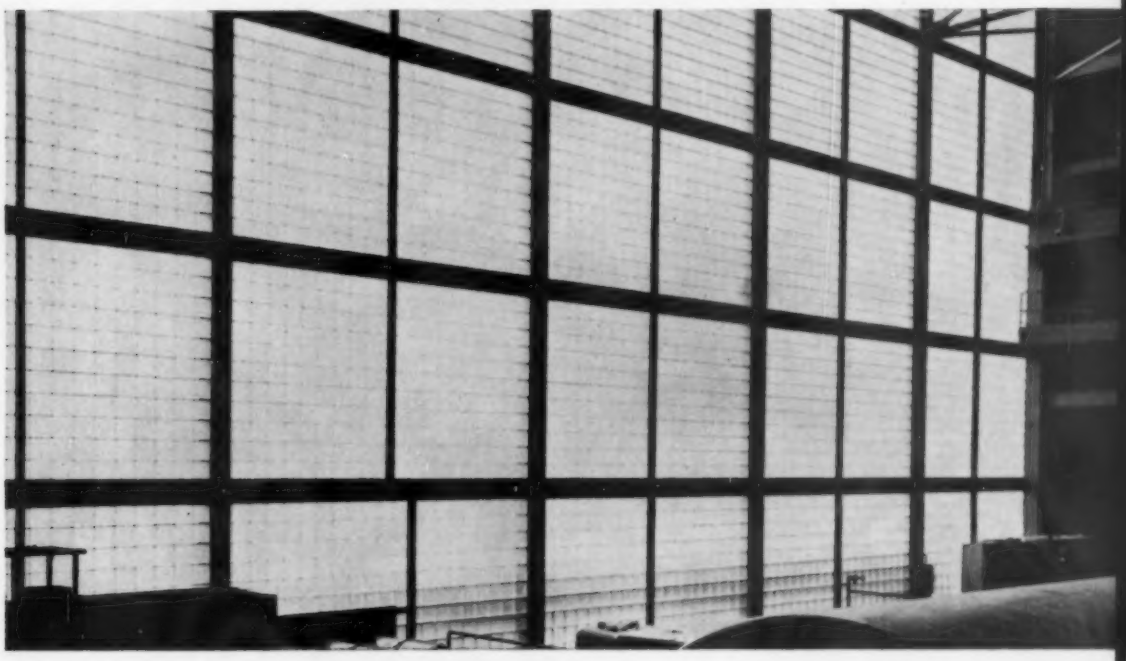
On installations where the cam is to actuate the switch only in one direction, the installer should use a swing type cam. He can also choose a limit switch with a roller that has a flat on it so that contacts are only made in one direction.

Other things that may cause limit switch failure are electrical overloads in using them beyond their rated capacity; falling objects such as heavy workpieces; and connecting contacts to opposite electrical polarities.

If you use good judgement in making the installation of the limit switches your solenoid valves in your pneumatic circuit will give a better performance.

In the next installment we will further discuss circuits connected with moving a workpiece. **End, Part VIII**

See why Pittsburgh Corning Products make the things you build look better, last longer, cost less



example: 11,000 PC Glass Blocks let light in, keep glare out, cut costs at Cromby Station

Back in the early forties, Philadelphia Electric Company first used PC Glass Blocks for major wall areas in one of their electric generating stations. Glass block walls have proved fully effective in providing controlled, glare-free, natural light within this plant. At the same time, they have completely eliminated sash repair and replacement, painting, window washing and breakage. Savings in maintenance costs have been substantial.

Latest of this company's glass block installations is at Cromby Station where 11,000 PC Glass Blocks on two walls provide nearly a quarter-acre of effective daylight control. Maintenance costs have been and should continue to be nil.

The examples are many, the moral clear: a PC Glass Block wall is a proven means of insuring proper daylighting at low cost with an end to window maintenance headaches.

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example:

FOAMGLAS®: the one insulation combining the seven benefits pictured here. These seven photographs illustrate a single important point about FOAMGLAS, the one cellular glass insulation. The point? No other insulation wraps up so many important benefits in one material.

However you use insulation, you'll find it of vital importance that FOAMGLAS is completely impervious to moisture—both liquid and vapor. This insures that FOAMGLAS will never fail to deliver the same high insulating efficiency. Its strength and rigidity give FOAMGLAS surprising structural value in many applications ranging from curtain wall panels to roof insulation, to cavity wall or even

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NEW PLANT CONSTRUCTION —advance information on location, costs

Pueblo, Colo.—Colorado Fuel & Iron Corp., Continental Oil Building, Denver, Colo., plans to construct a plant for the production of steel within 30 to 60 minutes instead of the seven to 10 hours usually required in the open hearth process. New facility, to be located here, will use an oxygen flame to create temperatures up to 2900 F. The oxygen converter, already under construction, is slated for completion by February 1961. New plant will represent a capital investment of about $8 million.

Honolulu, Hawaii—Western Operations, Inc., a branch of Standard Oil Co. of California, plans to double original investment in the 32,000-barrel-per-day refinery now under construction near here. Included in the expansion is a 13,000-barrel-per-day fluid catalytic cracker and alkylation plant for the manufacture of high-octane fuels; hydrogenation and isomerization units for specialized products and feedstocks; a carbon monoxide boiler, and sulfur recovery equipment. Crude still, treating plants and original plants will be completed late this year and additional equipment will go on stream by the middle of 1962.

Louisville, Ky.—Rohm & Haas Co., 712 Locust St., Philadelphia, Pa., has purchased a surplus butadiene plant located here which it plans to revamp for the production of acrylic monomers and polymers, basic raw materials for plastics, paint compounds, and textile and leather finishes. Construction contract will be let soon and production operations will begin in the summer of 1961.

Newton, Mass.—Sylvania Electric Products, Inc., subsidiary of General Telephone & Electronics Corp., 1740 Broadway, New York, N. Y., plans to construct a 180-acre campus-type electronics data processing complex to be built here in 1961. Plans include erection of an advanced research and engineering building of about 200,000 sq ft for development of data processing techniques, equipment and systems. Long range plans include construction of additional buildings for administration, marketing, training, and assembly activities.

Joplin, Mo.—Solar Nitrogen Chemicals, Inc. plans to construct a $15-million chemical plant near here. Construction of the plant, to be jointly owned by Standard Oil Co. (Ohio) and Atlas Powder Co., Wilmington, Del., is scheduled to get under way at once and completion of the ammonia unit is expected by the summer of 1961.

Harrison, N. J.—Nopco Chemical Co., Lewis & Carter Streets, plans to construct a plant for the production of isocyanates under a new process recently acquired by the company. Product used in the urethane foams manufactured by the company's Plastic Division is expected to be in production by January 1962. New facility will have a capacity of 10 million lb, expandable to 20 million lb annually and will represent an expenditure of several millions of dollars when completed.

Morristown, N. J.—Allied Chemical Corp., 40 Rector Street, New York, N. Y., plans to increase laboratory facilities at company's General Chemical Division located near here. Construction of the new facility, which will double present laboratory facilities will begin at once and will be completed in the last quarter of 1961.

Union, N. J.—Schering Corp., Bloomfield Ave. and Broad St., Bloomfield, N. J., plans largest single building project in company's history. Construction will start soon on a large warehouse and manufacturing plant adjacent to present company plant located on Morris Ave., this town. The 253,-000-sq ft facility will be completed in the spring of 1962 at a reported cost of $5.5 million and will cover nine acres of the firm's 27-acre tract.

Whippany, N. J.—Rayonier, Inc., 161 E. 42nd St., New York, N. Y., plans expansion of company's third and newest research center located here. Expansion will consist of a $400,000, 10,000-sq ft, two-story addition to the existing laboratory located on a tract of 82 acres. Completion of addition is scheduled for late this year.

Arcade, N. Y.—Motorola, Inc., 4545 W. Augusta Blvd., Chicago, Ill., plans major expansion and improvement program at company's plant here, at reported cost in excess of $1 million. The present 80,000-sq ft facility will be enlarged to 110,000 sq ft and work on the expansion will begin immediately. Plant addition itself will be completed late this summer and equipment for the new facility will be bought over a two-year period.

Syosset, N. Y.—Fairchild Camera & Instrument Co., Robbins Lane, this city, will begin construction soon on a new laboratory adjacent to company's present facilities here. New facility will be used for environmental testing of space information gathering equipment. New building will be completed by the summer of 1961 and will cost approximately $1.4 million with equipment.

West Nyack, N. Y.—Grant Pulley & Hardware Co. has awarded a contract to the Kretzer Construction Co. for an addition to the company plant located here. Present plant will be expanded to increase company's production capacity by about 20 per cent. Work on the new addition will get under way at once and is scheduled for completion by late fall of this year. Cost of the new addition reported to be in excess of $300,000.

Cincinnati, O.—Emery Industries, Inc., 2505 Carew Towers Building, this city, plans to construct an ozone oxidation plant for the production of azelaic and pelargonic acids. Ground-breaking ceremonies have already been held for the new facility which will cost about $6 million when completed in the spring of 1961. Azelaic acid is used as a plasticizer for vinyl plastics, with uses for dibasic azelaic acids developing in resins and polymers. Pelargonic acid is used chiefly as a modifying acid in resins and polymers.

Cincinnati, O.—Plax Corporation, Hartford,Conn., jointly owned by Monsanto Chemical Co., St. Louis, Mo., and Emhart Manufacturing Co., Hartford, Conn., has purchased a 12-acre building site near here on which it proposes to build a large plastics container plant. Work on the new facility will get under way at once for completion by the spring of 1962. Cost of the new plant is reported to be about $1.25 million.

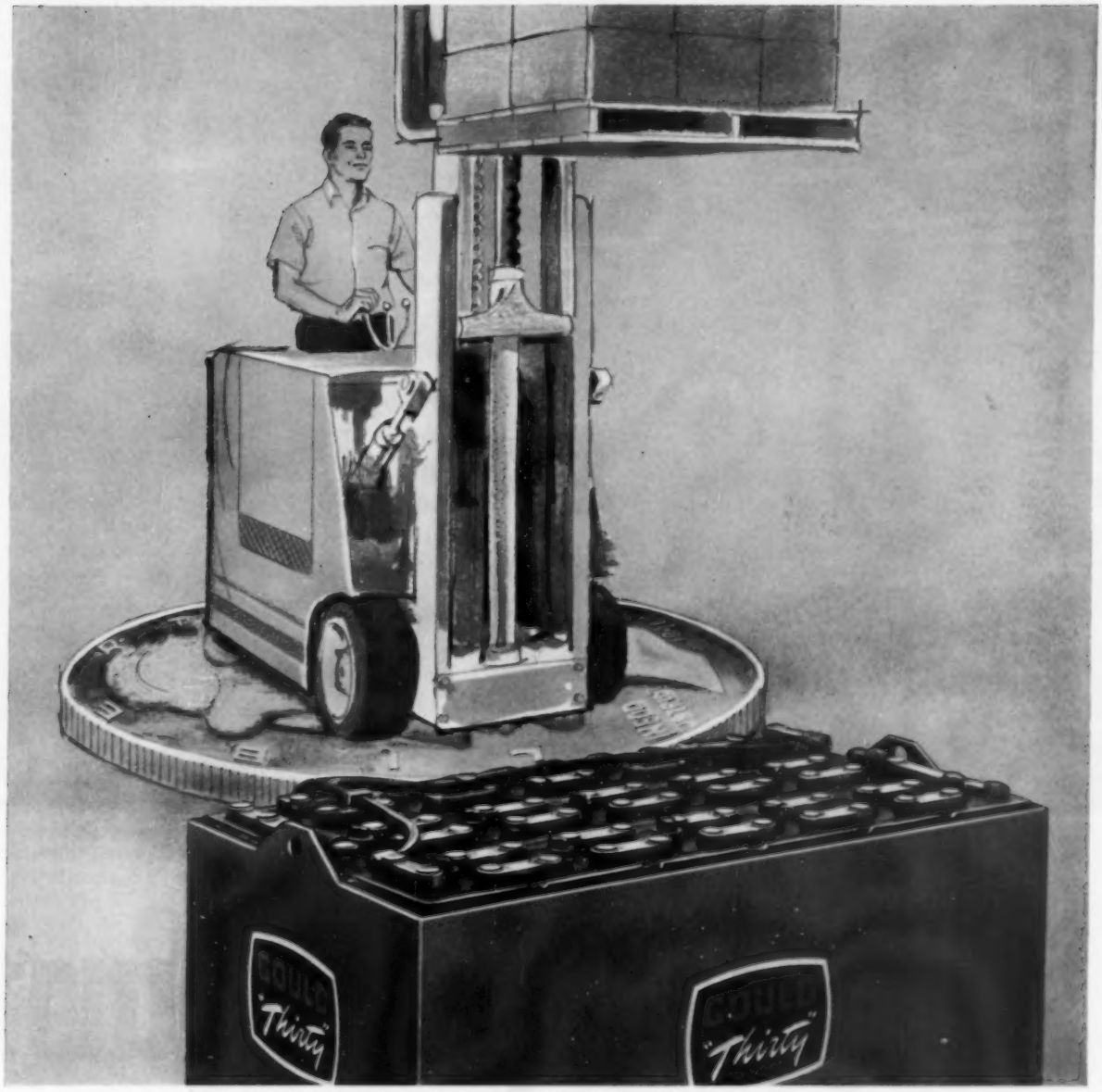
Columbia, Tenn.—Hooker Chemical Corp., 1940 Ward St., Niagara Falls, N. Y., plans to construct a third phosphorus furnace, kiln and materials handling system at local refinery here. Work is already under way and scheduled for completion by the latter part of next year at a cost of approximately $6.75 million.

Beaumont, Texas—Goodyear Tire & Rubber Co., 1144 E. Market St., Akron, O., will build a synthetic rubber plant on a 500-acre building site near this city. Plant will cost more than $20 million. Construction will begin immediately and is scheduled to be in production by the summer of 1961.

Carrollton, Texas—The Glidden Company, 10999 Madison Ave., Cleveland, O., will start construction at once on a $2-million paint, lacquer and industrial products plant just outside Dallas, Texas. Plant is scheduled to go into operation by the early part of next year and will have an initial capacity of 200,000 gallons per month.

El Paso, Texas—Border Steel Rolling Mills, Inc. is constructing a plant for the conversion of scrap metal into reinforcing steel for the construction industry. Company expects to begin melting steel about six months after

(Continued on page 240)



Electric Trucks are MORE MANEUVERABLE

Short-wheelbase electric trucks require less turning radius. They are capable of handling loads in much narrower aisles and congested areas. These battery-powered electric trucks make possible an increase in space utilization by reduction in aisle width.

Add maneuverability to a convincing list of other benefits—lower operating costs, less maintenance, clean, quiet and safe operation—and you can see the reason why users prefer battery-powered electric trucks for modern, efficient materials handling.

Electric truck users generally agree on one other point, too—Gould Batteries for longer life. With the new Silconic Plate, Gould Batteries offer up to 25% longer life.

Join the list of users who prefer this ideal combination of electric trucks and Gould Batteries. For more information, write or call your local Gould representative. Ask for booklet "Why We Use Battery-Electric Industrial Trucks." Gould-National Batteries, Inc., Trenton 7, N. J. In Canada, write to Gould-National Batteries of Canada, Ltd., 1819 Yonge Street, Toronto, Ontario.

More Power to you from **GOULD**

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BEFORE "Operation UPlight" Assembly Products, Inc., of Chesterland, Ohio, had to supplement their general lighting system with additional fixtures to provide sufficient illumination at work levels for their precision manufacturing operations. This combination resulted in extreme brightness variations.

Only 7/10¢ per hour*...

"The combination of at least 300 footcandles along with the determination of the most practical mounting height (7′ 6″) made the selection of the lighting fixture at Assembly Products, Inc. an extremely critical consideration,"

says Consulting Engineer
Anton J. Eichmuller
Cleveland, Ohio

"However, after seeing the results of the installation, we were firmly convinced that our choice of Day-Brite CFI-30 Power-Groove Industrials was right. The resulting low-brightness and high efficiency are evident to all; most importantly to the people working in the area because it eliminates eye fatigue.

"Of almost equal importance are the excellent design and construction features of CFI-30, which were attested to by the electrical contractor (Herbst Electric Co.) who installed the Day-Brite units. These features too will pay big dividends to the owner for years to come.

"The excellence of the results, plus the fine handling of the order by Day-Brite factory and local representatives, have given us another outstanding job, fully appreciated by Mr. Saint Amour (President, Assembly Products) and myself. This is an example of another Day-Brite installation well received and appreciated."

A. J. Eichmuller (right) and Day-Brite representative Tony Dunn examine the Day-Brite CFI-30.

AFTER "Operation UPlight" Day-Brite CFI-30 fixtures, equipped with Power-Groove lamps, boosted illumination to 300 footcandles and balanced brightness with 22½% uplighting. Fixtures were mounted in continuous rows on 7-foot centers, 7½ feet above the floor. The ACTUAL difference is even greater than these photographs show.

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More light for less money with Day-Brite CFI® fixtures!

That's "Operation UPlight". The new Day-Brite CFI (Comfort For Industry) fixtures are designed to deliver the higher lighting intensities currently recommended . . . yet substantially reduce installed, operating and total owning costs. And *now*, with prices reduced as much as 17.7%, Day-Brite CFI fixtures are within the range of *every* industrial lighting application.

For actual cost figures comparing Day-Brite CFI fixtures with other lighting systems, call your Day-Brite representative listed in the Yellow Pages. See for yourself why hundreds of companies across the country have put "Operation UPlight" into action, making it the most successful program in Day-Brite history. PHONE TODAY!

**per footcandle for each 10,000 square feet. Based on 4,000-hour operation, 1¢ per KWH rate, 35% lamp discount, typical maintenance cost, and amortizing the cost of buying and installing the lighting units over a ten year period.*

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DAY-BRITE OPERATION UPLIGHT

Day-Brite Lighting, Inc.
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NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

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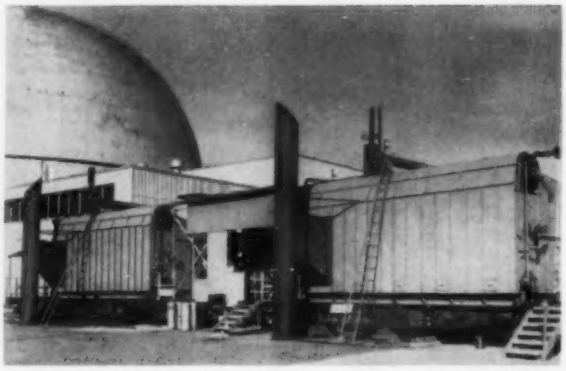
Package Boilers Team Up To Simulate Nuclear Reactor Operation

PRELIMINARY TESTING operations prior to the activation of Commonwealth Edison Company's Dresden Nuclear Power Station near Chicago was "powered" by two flat-car-mounted package steam generators positioned near the station's spherical nuclear reactor building.

The problem was a matter of checking the nuclear unit steam lines and balancing the turbine of the atomic facility prior to the startup of the entire nuclear reactor system. The solution was the use of two Keeler package steam generators, arranged to simulate the eventual pattern of nuclear operation.

Two 55,000 lb per hour capacity units were fired up five days after their arrival at the jobsite, without removing them from the rail cars on which they arrived from the Keeler plant in Williamsport, Pa. Fuel oil was piped direct to the burner through temporary underground lines.

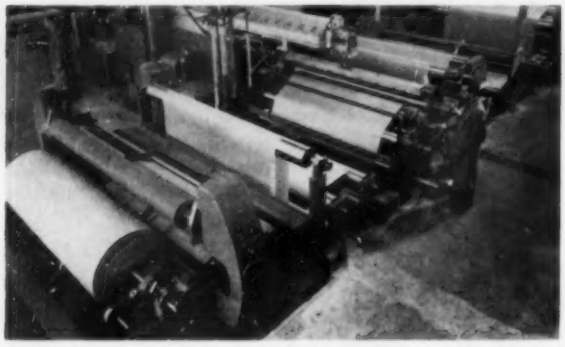
The two generators were operated at capacities up to 68,000 lb per hour in the preliminary checking and later final testing of the plant's steam system.



Privately financed, the Dresden station is the largest all-nuclear power plant to go into operation in the United States. The 180,000 kw plant, which began operations recently, is providing electricity for Northern Illinois.

Big Extruder Puts Polyethylene Film on Paper, Board, Foil or Film

NINETY-SIX INCHES in width, and capable of extruding polyethylene films onto paper or board materials, an out-size extruder was recently put into operation by American Sisalkraft Corp.



It is planned to produce standard polyethylene-coated materials as well as special grades on the new machine. The anticipated combinations include vaporproof and greaseproof papers and boards for conversion to packaging wraps, multiwall bags, folding cartons and the general purpose vapor barriers.

The machine is equipped with built-in quality control devices, including a beta-ray gage to insure a constant thickness during each run.

A pilot machine, also installed, will be used to test and check special combinations, to produce working samples, to evaluate new resins, to research the physical and mechanical properties of various products, and to do continuing work on various production problems and quality control.

Infrared Oven Dries Paint With Improved Speed, Finish, and Bond

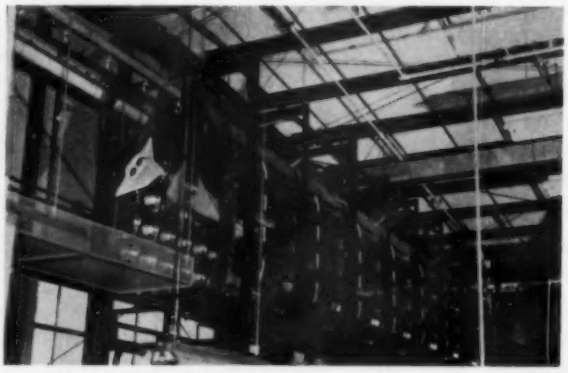
PAINTING PRODUCTION on small parts has shown a 100 per cent increase on many of the parts, since the installation of a 28-ft driQuik ceramic type electric infrared oven at the Emerson Electric Mfg. Co., East St. Louis, Ill.

The firm manufactures a variety of parts used by the military. After painting with zinc chromate and epoxy finishes, these parts, of many sizes and shapes, formerly were racked and baked in an electric batch oven 20 to 30 minutes.

Since the installation of the driQuik infrared oven, various pieces, regardless of size or shape, are dried in as little as 2½ minutes. In addition infrared drying results in a better finish and a better bond, according to the company, thereby enabling the plant to meet the latest military specifications on paint finishing requirements.

Fast drying of parts of so many sizes and shapes is made possible by positive temperature control in each of the two oven zones. Temperature can be brought to any point from 0 to 100 per cent of rated power and held to less than one degree of variation. Zoning the oven and temperature makes it possible to have the right heat at the right time for any size part going through the oven without changing conveyor speed or baking distance.

Maintenance costs for the oven have been negligible. There are no bulbs, quartz tubes or sockets to burn out.



THERE'S A REAL DIFFERENCE IN SAFETY-SWITCH SAFETY!

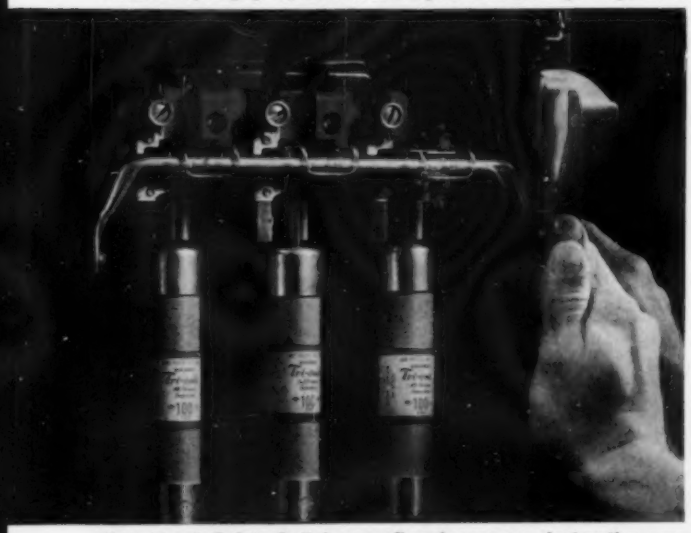
The *real* difference in safety . . . and the difference is *very* real . . . lies in switch performance under electrical load. You can spot this difference instantly when you compare the action of BullDog Vacu-Break® Safety Switches.

When you operate Vacu-Break Safety Switches under load, there is no blinding flash, no dangerous arc "explosion". The exclusive Vacu-Break design double-breaks the circuit, confines the arc within the enclosed switch head, smothers and extinguishes it instantly. Maintenance of contact points is virtually eliminated, and *you don't have to open the switch-box door to know the contact is broken.*

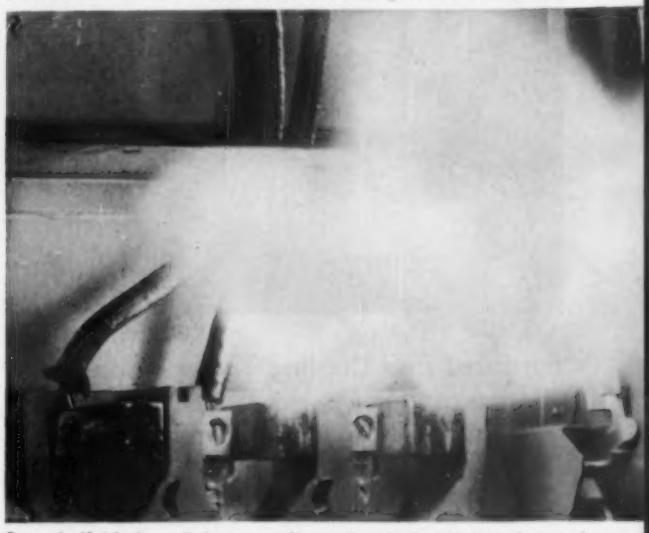
The operating handle is connected directly to the Vacu-Break heads. Push the handle "Off" and contact is broken positively every time. There are no toggles, triggers or springs to depend on. You know the switch is "Off" without looking.

Clampmatic® assembly gives clamped pressure contact, speeds "break". This means positive, safe operation, and long, trouble-free switch life. In safety switches, the *real* difference in safety lies in design and performance. Compare BullDog Vacu-Break Safety Switches with other types, and then *see* the difference!

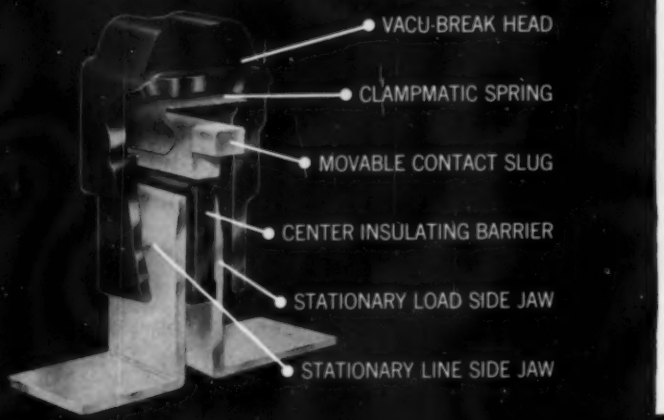
Unretouched photographs of the arc in 100-Amp 600-volt switches operating under 90-Amp 440-volt load with 40% to 50% power factor. Pictures taken at instant of break.



Vacu-Break Safety Switches confine dangerous, destructive arcs inside arc chambers, and smother them instantly.



Open knifeblade switches permit arc "explosions", burning and pitting contact points. The result—fire hazard and switch damage.



Cutaway of Vacu-Break switch head, showing movable contact slug inside arc-smothering closed chamber. Clampmatic spring assembly gives bolt-tight contact, speeds "break", increases switch life.

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Michigan. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

For Safety's Sake—Buy Vacu-Break

BULLDOG ELECTRIC PRODUCTS DIVISION
I-T-E CIRCUIT BREAKER COMPANY

®

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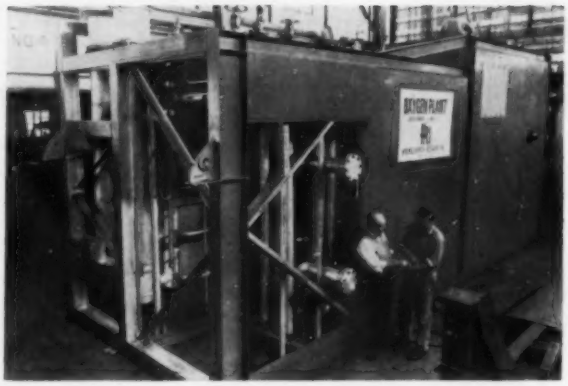
Bulk Oxygen Plant Set To Serve Steel Furnaces and Converters

A TONNAGE OXYGEN PLANT, designed by Hydrocarbon Research, Inc., to feed the open hearth furnaces and Bessemer converters of the Wheeling Steel Corp. is being shipped in sections to Mingo Junction, Ohio for installation.

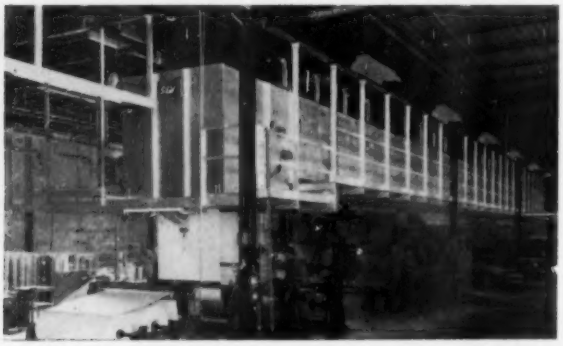
The plant, which will be operated by Hydrocarbon Research and Wheeling Steel through a jointly-held company, is to supply oxygen to the furnaces and converters to permit production of higher quality steel. The oxygen produced will be piped to Wheeling's nearby plant in Steubenville, Ohio.

Prefabrication of the plant in several sections was made to permit shipping from the fabricating plant to the operating site. Included in the sub-assemblies are huge cold boxes which produce the low temperatures needed to extract oxygen from air. Designed to operate at temperatures of —300 F, the cold boxes contain a variety of heat exchangers, fractionating towers, piping, valves and other low temperature equipment.



Installed capacity of the plant will be 420 tons of oxygen per day, including 40 tons of liquid oxygen. Design of the plant, the cost of which has been set at more than $6,000,000, permits expansion to at least 620 tons of oxygen per day.

Six-Zone Oven Has Close Temperature Control in Each Zone



THIS SIX-ZONE continuous oven is being used by Morgan Adhesives Company, Stow, Ohio, for curing and drying self-adhesive print stocks, foils and plastic film papers.

Features of the oven, developed by W. W. Sly Manufacturing Company, include: (1) close temperature control in each zone; (2) design permits safe handling of hazardous material, as well as around-the-clock operation, and (3) overhead installation leaves floor space free for other work operations.

The insulated oven shell is 150 ft long, 7½ ft wide and 4 ft high. It is divided into three 50-ft sections, with Zones 1 and 2 in the first section, Zones 3 and 4 in the second section and Zones 5 and 6 in the third. There are 25 access doors and a walkway along the oven's length.

Furnaces and Cooling Tower Heat Treat Shafts in Vertical Position

INSTALLATION OF seven new vertical furnaces for heat treating electric-power generator rotors has been completed at the forging division of United States Steel's Homestead District Works. The new facilities, consisting of a quench tower and an upending cradle in addition to the seven new furnaces, were built primarily to heat treat rotors in an upright position after they have been forged and machined.

Housed in a 100-ft-high building, the new furnaces extend 35 ft below the concrete floor, rise 50 ft above it and can accommodate rotors and generators 40 ft in length and 60 in. in diameter.

An unusual part of the new installation is the upending cradle, developed by Homestead Works and being introduced for the first time in the vertical heating process. A cradle seesaws on an axis to raise the forging into vertical position, protecting it, in the process, from being bent while hot. An overhead crane can then lift the forging from the upender and carry it to a waiting furnace.

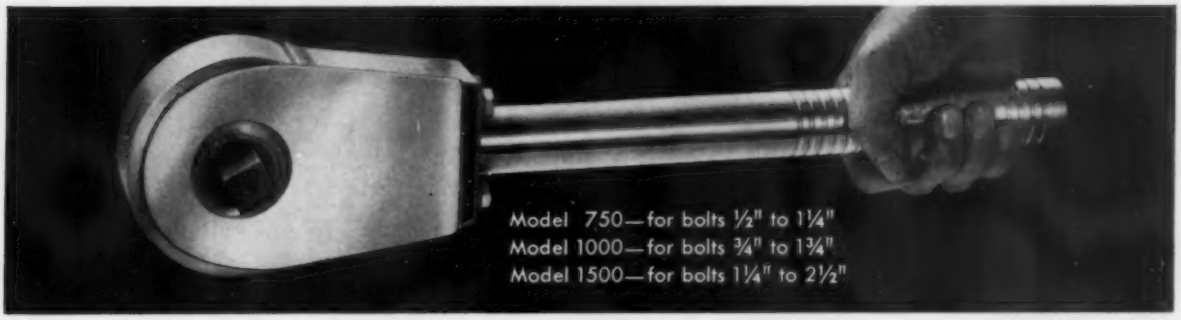
Use of the upending cradle to place the workpiece in vertical position obviates the need to handle the shaft in horizontal position, without support at its center.

The quenching tower rises from a base at floor level to a height of 75 ft. It has double doors, automatically operated and opening along the entire height of the tower to admit the forging. Once inside, the piece fits onto a rotating table, which spins it in air or water jets until the forging is cooled to the desired temperature.

designed to solve a universal maintenance problem . . .

first manual impact wrench that works . . .
LOOSENS THE TOUGH NUTS
EVEN POWER WRENCHES CAN'T BUDGE!

SWENCH®



• Loosens "frozen" nuts in seconds • Tightens nuts to maximum practical tightness

There's never been anything like Swench before. It is an entirely new concept in wrench design. Swench is the world's *only manual impact wrench.* Here's what Swench means to you . . .

NEW SPEED—Nuts that previously had to be burned off can now be "Swenched off"—with unbelievable ease—by *one* man—in a matter of minutes.

NEW EASE—Only Swench in its torque class is truly portable . . . lets you take the wrench to the job—*anywhere*—with no auxiliary equipment, no power connections.

NEW SAFETY—With Swench there's no back-breaking, knuckle-knocking struggle . . . no dangerous handle extensions . . . no sudden release of a frozen nut . . . no shock transmitted through the handle.

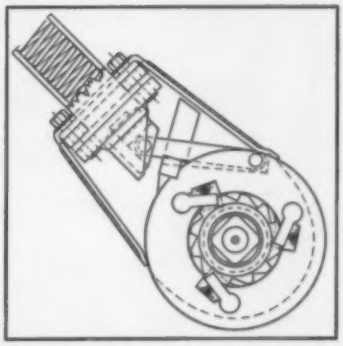
See for yourself! Swench is so different from anything you've experienced, you'll have to see it in action to believe it. For a quick and convincing demonstration, contact Marquette.

NEW POWER—Swench, size for size, gives greater—and more effective—torque than power wrenches . . . multiplies torque applied to handle over 1500% (yet all Swench's power is built into the wrench itself).

NEW ECONOMY—Swench saves in *many* ways . . . no auxiliary equipment to maintain and man, no costly upkeep on the wrench, no man-hours fighting frozen nuts—*and* Swench costs less than half as much as wrenches with comparable impact power.

NEW VERSATILITY—*One* Swench can handle more bolt sizes than any power wrench . . . loosening or tightening requires no special adjustments.

NEW TENSIONING ACCURACY—Precise tightening is assured with Swench, following simple instructions.



INSIDE STORY—How is all this possible? Unlike power wrenches that deliver many tap-like blows, or ordinary manual wrenches that apply steady torque, Swench builds up power in its super-strong spring for a mighty wallop that is released as torsional impact every time the handle is advanced slightly more than 30 degrees.

Write for further information.

"When you're up against the tough nuts . . .
Don't wrench it . . . SWENCH it!"

MARQUETTE DIVISION

CURTISS WRIGHT

CORPORATION · 1148 GALEWOOD DRIVE, CLEVELAND 10, OHIO

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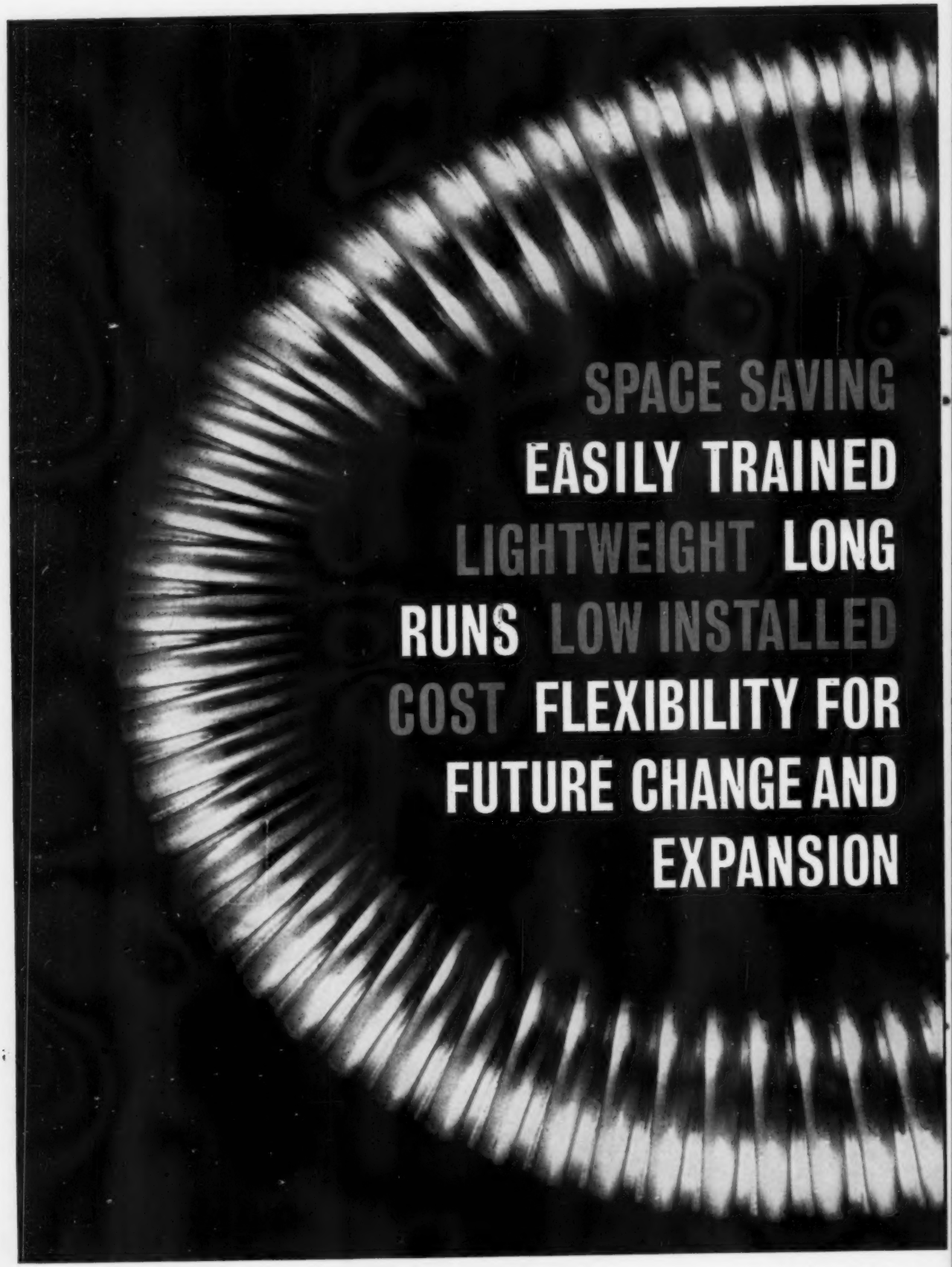
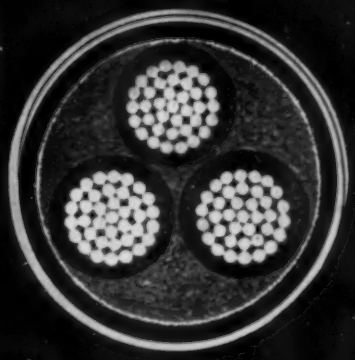

SPACE SAVING
EASILY TRAINED
LIGHTWEIGHT LONG
RUNS LOW INSTALLED
COST FLEXIBILITY FOR
FUTURE CHANGE AND
EXPANSION

GENERAL CABLE

INTERLOCKED ARMORED CABLE

For full protection under all conditions install General Cable Interlocked Armor...the cable for power, control, communication and lighting systems. This compact, versatile cable is available in a wide range of constructions, insulations, armors and voltage ratings. Colored polyvinyl chloride jacket over the armor can be furnished where required. "How to Obtain the Greatest Advantage Per $ Spent" a comprehensive folder detailing General Cable's complete line of Interlocked Armored Cables is available upon request. **General Cable Corporation**, 730 Third Avenue, New York 17, New York. Offices and Distributing Centers Coast-to-Coast.



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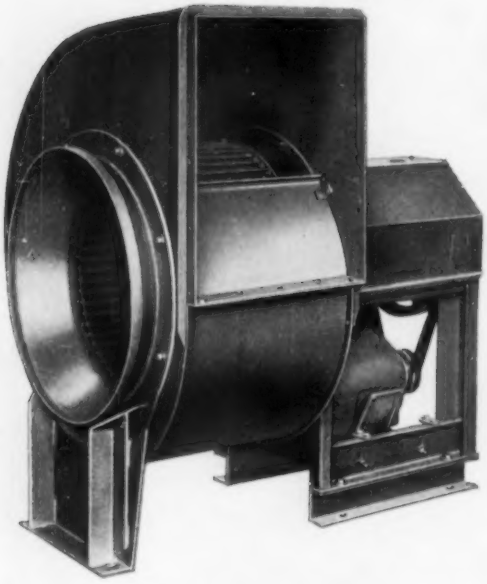
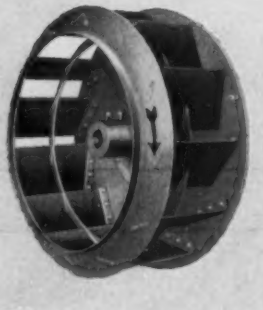
CLARAGE

New line of
V-belt driven
Ready Units



LS Ready Units have Low Speed, forward curved blade wheels. These are of the long-recognized Clarage Type HV multiblade design.

or



MS Ready Units have Medium Speed, backward inclined blade wheels with non-overloading horsepower characteristic. These are of the highly regarded Clarage Type NH, Class I design.

Exceptionally sturdy, quiet, ready-to-run fan sets

- for volumes up to 25,000 CFM
- for static pressures thru 2½"
- for clean air up to 300° F.

Distinguishing points — over 15 of them — make these new Clarage units outstanding.
To mention a few: Better motor ventilation . . . entire drive within frame of unit . . . complete accessibility to motor, drive, and bearings. Learn more about the numerous specific advantages that mean greater value to you from Clarage. Request Catalog 517 . . . 36 pages of complete information, selector charts, capacity tables, dimensions.

Clarage Ready Units are ideally suited for supply or exhaust jobs — indoors or outdoors — for buildings of all types, all sizes.

Write for your Copy

Dependable equipment for making air your servant

CLARAGE FAN COMPANY

Kalamazoo, Michigan

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

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For your next building . . . . . Color? Configuration? Single Wall? Sandwich Wall? Insulated Panels?

Your selection and procurement are simplified by investigation of EGSCO metal wall products. They comprise a complete range of sheet and panel configuration, a usable variety of baked-on, durable enamel colors, and a practical assortment of wall components in your choice of aluminum or steel.

EGSCO metal wall products are engineered for sound building construction with an economy attained through improved erection techniques, reducing erection time.

EGSCO metal wall quality and practicality have been built upon the experience of years in actual building design and erection. Thousands of EGSCO buildings from coast to coast attest these attributes.

Finally there is this plus: EGSCO erection crews have the experience and know-how to erect any of these wall combinations quickly, soundly and at a realistic cost, where this service is desired.

Here's how you can contact the nearest district office of Elwin G. Smith & Co., Inc., manufacturers of EGSCO metal wall products:

Boston	CEdar 5-1924
Chicago	KIngswood 3-3350
Cleveland	JAckson 6-4332
Detroit	Toledo, Ohio GReenwood 4-8198
New York	Clifton, N. J. PRescott 3-3313
Philadelphia	OLdfield 9-6655
Pittsburgh	POplar 1-7474
Toledo	GReenwood 4-8198

See these EGSCO products in Sweet's:

Architectural File:	Industrial Construction File:
Curtain walls 3a/Sm	Curtain walls 3a/Sm
Sandwich walls 8b/Smi	Sandwich walls 8b/Smi
Corrugated sheets 8b/Sm	Corrugated sheets 8b/Sm
Roof Deck 2c/Sm	Curved conveyor hoods 8b/Smt
Steel forms for concrete roof and floor slabs 2a/Sm	Roof Deck 2d/Sm
	Steel concrete forms 2b/Sm

Copies of these catalogs may be obtained from the nearest office of:

ELWIN G. SMITH & CO., INC.

Manufacturers of EGSCO® Metal Wall Products

Pittsburgh 2, Pa.

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FULL-VALUE
CERTIFIED
TRANSFORMER
GENERAL ELECTRIC

• Superior design, features, and performance
• Faster shipment
• Complete service

NOW 12% higher

SYMBOL OF FULL VALUE

With this seal, General Electric certifies full value for your transformer dollar; full value in terms of superior basic design, features, and performance . . . plus faster order handling and shipment . . . plus complete service before, during, and after installation. No other transformer manufacturer can match this complete General Electric package.

continuous loadability

General Electric's new Permalex* insulation system increases medium transformer continuous kva capability, or gives five times longer transformer life

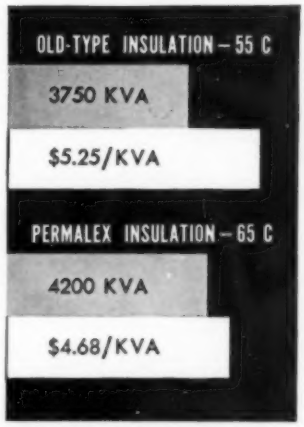
Now, as standard on all medium transformers**, and at *no extra price*, General Electric uses Permalex insulation . . . a system permitting transformers designed for 55 C rise to operate at 65 C rise with 12% more continuous capacity!

For example, a 3750-kva, 55 C transformer with Permalex will operate at **4200 kva**, 65 C rise with normal life expectancy. Or, if you prefer to operate the unit at 55 C, you can expect five times the life of present insulating systems! Fan-cooled rating increments remain the same and can be applied at the 65 C operating condition. Also, Permalex is *completely compatible* with everything in the transformer.

The Permalex system used in General Electric medium transformers features Formex† wire and cyanoethylated paper insulation. Formex insulated wire offers exceptional dielectric strength, outstanding thermal stability and high resistance to moisture effects. Cyanoethylation, which replaces many moisture producing molecules with non-moisture producing molecules, raises the thermal endurance of paper and retards the formation of water.

Ask your G-E Apparatus Sales Engineer to point out the many ways you save with Permalex insulated transformers . . . another result of General Electric's *continuing* Certified Full-value Transformer Program. General Electric Company, Schenectady 5, New York. 416-29

* Trade-mark of General Electric Company.
** 501 to 7500 kva, 69 kv and below.
† Reg. Trade-mark of General Electric Company.



PERMALEX INSULATION gives you extra kva at no additional transformer cost. The result is more economically uprated substations because of the lower cost per kva with no increase in transformer size.

55 C Self-Cooled	65 C Self-Cooled	65 C Fan-Cooled
750 kva	840 kva	966 kva
1000	1120	1288
1500	1680	1932
2000	2240	2576
2500	2800	3500
3750	4200	5250
5000	5600	7000
7500	8400	10500

DEFERRED CHANGEOUT of added kva gives more years of operation without extra investment. Real evaluation of Permalex is measured by present worth of capitalized value of deferred investment.

FORMEX TURN INSULATION with cyanoethylated paper insulation provides high dielectric strength, outstanding resistance to moisture and much longer life for medium transformers.

Progress Is Our Most Important Product

GENERAL ELECTRIC

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Flintkote Built-Up
Roofing Representative
Tony Plonski says...

"Let it rain... let it storm...

No other known form of bituminous roof coating—when exposed to weather—will outlast Flintkote's Aluminized® Static Coating!

"Aluminized Static is a protective coating that gives all the high reflective insulating qualities of aluminum—PLUS the waterproofing and durability of asphalt static. Aluminized Static can't burn . . . doesn't stain or alligator-crack over any normal type of asphalt sub-surface. It retains its brilliance for five years and longer . . . and won't flow even in the hottest weather.

"Protective, long-life Aluminized Static Coating can be used—beautifully—on metal, masonry, glass or asphalt-covered surfaces."

For particulars and literature, see your Flintkote Representative. You'll find he's a great guy to work with . . . and he knows his stuff in building materials.

The Flintkote Company, 30 Rockefeller Plaza, New York 20, N. Y.

®REGISTERED BY THE U.S.PATENT OFFICE

FLINTKOTE®

America's broadest line of building materials

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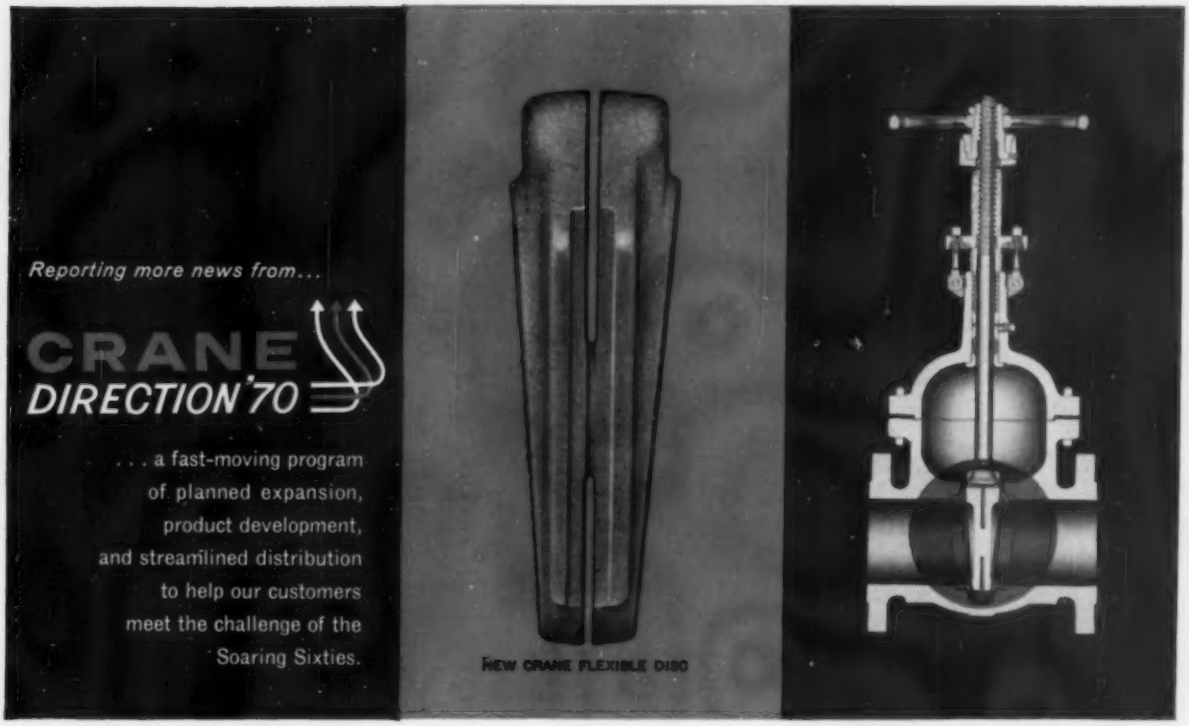

The most significant advance in gate valve design in 25 years...

CRANE FLEX GATES®

Instead of being made with a solid disc, new, patented Crane Flex Gates have separate disc faces, connected by the axle-like unit shown in the cross section. This joins the two seating faces, yet provides flexibility for the faces to seat tightly with independent action.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates seat with less torque.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates unseat with less torque . . . will not stick closed even when closed while hot and allowed to cool.

BECAUSE THEY'RE FLEXIBLE, minor deflection of seating faces due to pipe strains does not affect tightness of Crane Flex Gates.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates are tight on inlet seat and outlet seat over a wide range of pressures.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates can be used singly in some services where two conventional gate valves are frequently specified. You can save substantially on piping costs.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates can be serviced—body seat rings replaced or seating faces refinished—quickly, and without painstaking accuracy. Slightly off-taper seats do not affect tightness or operating ease.

BECAUSE THEY'RE FLEXIBLE, new Crane Flex Gates will easily outperform any conventional solid wedge disc valve you now use. *And there's no increase in price.*

BECAUSE THEY'RE MADE BY CRANE, these new Flex Gates are completely dependable. You can use them with complete confidence on steam, water, gas, oil or oil vapor service. Stem and disc seating faces are Crane Exelloy. Shoulder-type body seat rings are Exelloy or Crane No. 49 Nickel Alloy. Sizes: 12 inch and smaller; 150- and 300-pound pressure classes.

Ask your Crane Distributor for full information on Flex Gates—and for data whenever you work with the products Crane makes. He has the newest in information and products. Crane Co., Industrial Products Group, 4100 South Kedzie Avenue, Chicago 32, Illinois.

CRANE®

VALVES • ELECTRONIC CONTROLS • PIPING • PLUMBING • HEATING • AIR CONDITIONING

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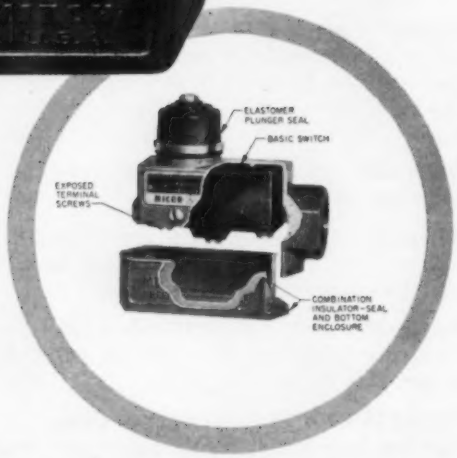
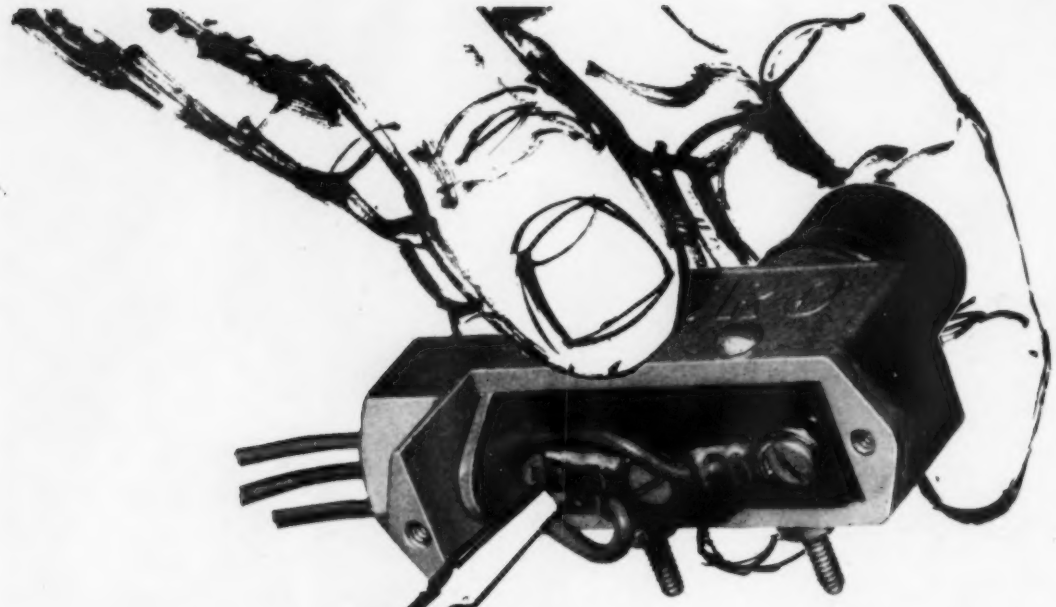
So Easy to Wire.....

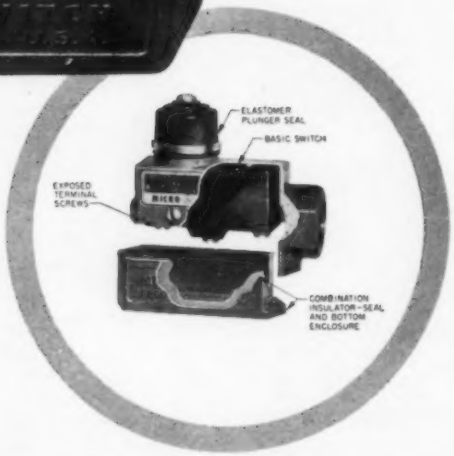


Time savings resulting from quick, easy wiring make MICRO SWITCH "E6" enclosed switches the standard for more and more industrial applications. The rugged die-cast housing is specially designed to open so the terminals are easily accessible for wiring. A hex-shaped conduit hub also makes installation easier.

"E6" switches have a combination insulator-seal permanently cemented into the bottom half of the housing to eliminate separate handling and possible loss or wrong installation of unattached gaskets. They are sealed against dirt and oil splash, and the basic switches are replaceable. See the Yellow Pages for the name of the nearby MICRO SWITCH authorized distributor or branch office and check the savings "E6" switches can yield in your plant.



So Easy to Wire.....



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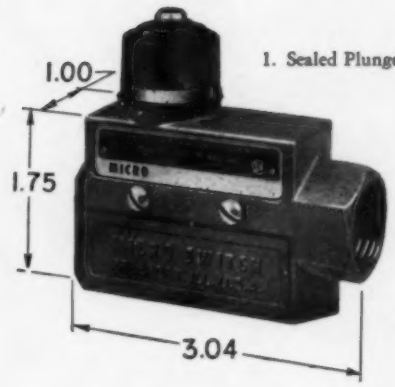


1. Sealed Plunger

....“E6” Enclosed Switches

“E6” Side-Mount

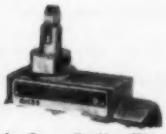
“V6” Bottom-Mount

2. Both Shown With Overtravel Plunger

3. Sealed Roller Arm

4. Roller Arm

5. Roller Plunger



6. Cross-Roller Plunger

7 One-Way Roller Arm

8. Rod Actuator

Side-Mount and Bottom-Mount Models —Choice of 8 Actuators in Each!

These easy-to-wire switches are available in both side-mount models (“E6”) and bottom-mount types (“V6”). Both series offer a choice of eight different actuators, a wide range of operating characteristics and contact arrangements.

The dimensions of the rugged die-cast housings for “E6” and “V6” switches are the same as MICRO SWITCH “E” and “V” Series switches. This feature makes them interchangeable. Ask your MICRO SWITCH Authorized Distributor to show you the difference. He stocks a full line of enclosed snap-action switches and, because of his nearby location, can bring you important savings by avoiding down time on your production line.

Write for Catalog 83.

MICRO SWITCH . . . FREEPORT, ILLINOIS
A division of Honeywell
In Canada: Honeywell Controls Limited, Toronto 17, Ontario

H HONEYWELL **Honeywell**
MICRO SWITCH Precision Switches

75 YEAR HONEYWELL PIONEERING THE FUTURE

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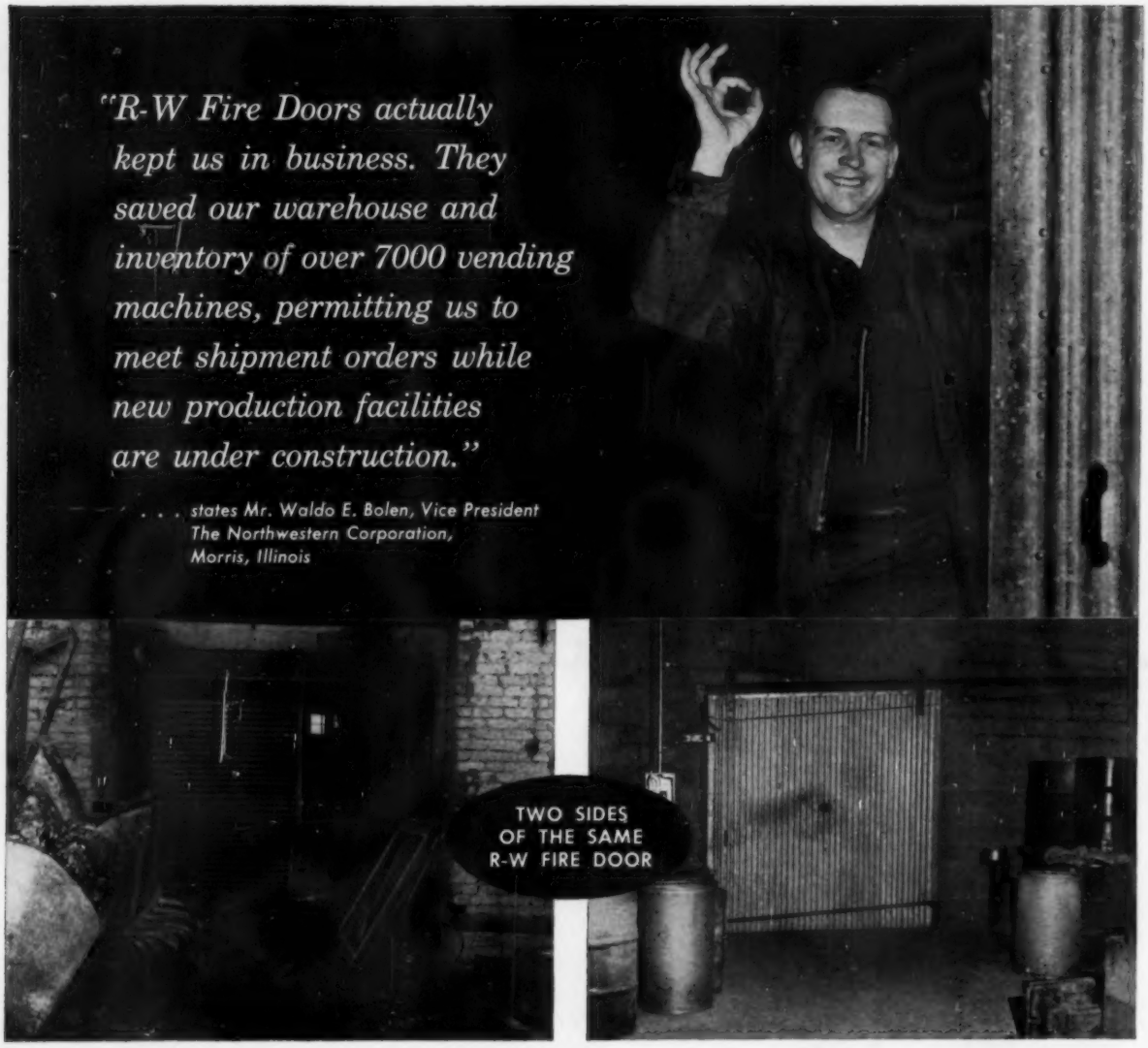
"R-W Fire Doors actually kept us in business. They saved our warehouse and inventory of over 7000 vending machines, permitting us to meet shipment orders while new production facilities are under construction."
. . . states Mr. Waldo E. Bolen, Vice President
The Northwestern Corporation,
Morris, Illinois
TWO SIDES OF THE SAME R-W FIRE DOOR

R-W "FyeR-Wall" FIRE DOORS AGAIN PROVE THEIR VALUE!

Fire broke out in the production department of the Northwestern Corporation, manufacturers of vending machines, early one morning. In just a few hours the complete production facilities and adjoining offices were destroyed . . . a loss estimated at over $500,000.00. The adjoining warehouse that was separated from the production department by R-W "FyeR-Wall" No. 347 Corrugated Steel Fire Doors, was not damaged. The photos above provide graphic testimony to the value of R-W Fire Doors. While the fire wrought havoc on the production department side of the doors, the roaring inferno was stopped from entering the warehouse. The extreme fire damage is evident in the photo above left, while the warehouse area, photo above right, is clean and free from fire or smoke damage.

R-W Fire Doors are Underwriters and Factory Mutual Laboratories approved for class A, B, C, D, E and F openings. "FyeR-Wall" Corrugated Doors are but one of many types of fine Doors offered by R-W . . . each type is designed to offer specific characteristics to meet various requirements. Complete hardware for single or double link operation.

Write today for complete information on how R-W Fire Doors will provide added safety for your plant . . . request your free copy of Catalog No. A-420.

Richards-Wilcox

MANUFACTURING COMPANY

A HANGER FOR ANY DOOR THAT SLIDES

460 W. THIRD ST. • AURORA, ILL. • Branches in Principal Cities

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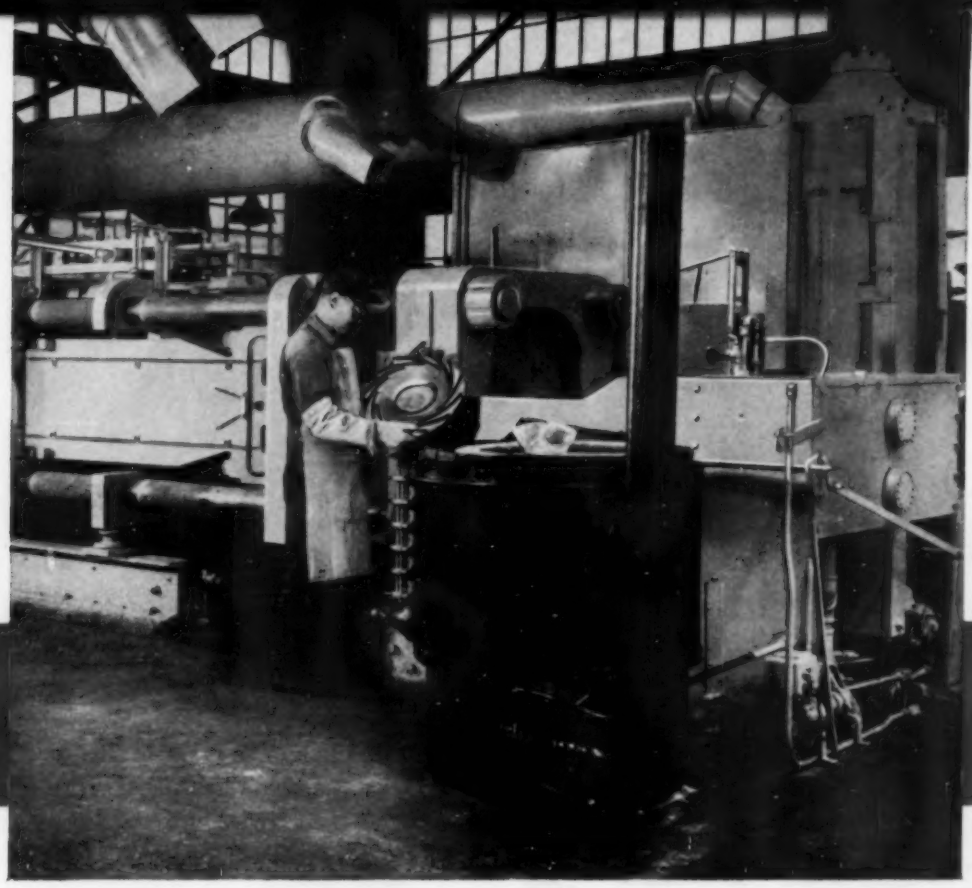

A 750-ton cold chamber die-casting machine at Alcoa's Garwood plant. Holding furnace in foreground containing molten metal is close to pressurized hydraulic lines.

Cellulubes promote safety at Alcoa

where hydraulic lines at 3500 psi pass near molten metal

The danger of fire due to line breaks has been held to a minimum at Alcoa's Garwood Works. In die-casting operations, Aluminum Company of America uses Cellulube fire-resistant hydraulic fluids in the hydraulic system serving the die-casting machines.

Although there have occasionally been line breaks under pressures ranging up to 2,000-3,500 psi, no serious fires have ever resulted. Alcoa has found that Cellulubes not only perform well as hydraulic fluids, but provide excellent lubrication of pump parts.

Cellulubes, the *safe* hydraulic fluids, are available in six controlled viscosities: 90, 150, 220, 300, 550 and 1000 SUS at 100°F. You can select the viscosity best suited to your operations. Cellulubes may well make an important contribution to the safety of your plant and personnel. Write to us for more information about Cellulubes. If you'd like a sample for evaluation, please let us know what application you have in mind.

Celanese® Cellulube®

Celanese CHEMICALS

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a Division of Celanese Corporation of America
Dept. 585-G, 180 Madison Ave., New York 16, N.Y.

Canadian Affiliate: Canadian Chemical Company Limited, Montreal, Toronto, Vancouver
Export Sales: Amcel Co., Inc., and Pan-Amcel Co., Inc., 180 Madison Avenue, New York 16.

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You never paint V-Corr roofing and siding

...YOU WASH IT WITH RAIN!

V-Corr is the only heavy-duty corrugated steel protected with a ceramic skin. It gives you almost endless years of service—and it's maintenance-free.

The colored coating is fused into the metal at temperatures over 1500°F. As a result, steel and coating become a single mass.

You never have to paint V-Corr –
weather won't wear it; colors are permanent.

You never have to rustproof V-Corr –
corrosion can't attack it.

You never have to fireproof V-Corr –
it's rated non-combustible.

You need no special tools for V-Corr –
you can cut it, drill it, stack-drill it.

If "special problem areas" have been running up your costs for roofing and siding, V-Corr is your ticket. It's unaffected by salt air, moisture, steam. It's resistant to industrial fumes, gases, most corrosive chemicals.

Look into it. It's a money-saver.

V-Corr Ceramic-Coated Roofing and Siding is an exclusive product of

THE BETTINGER CORPORATION
Milford, Massachusetts · Toledo, Ohio

IN CANADA:
Cerametal Industries, Streetsville, Ontario

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V-Corr Bulletin 60 brings you specifications, engineering data, and erection procedures. Write for a copy

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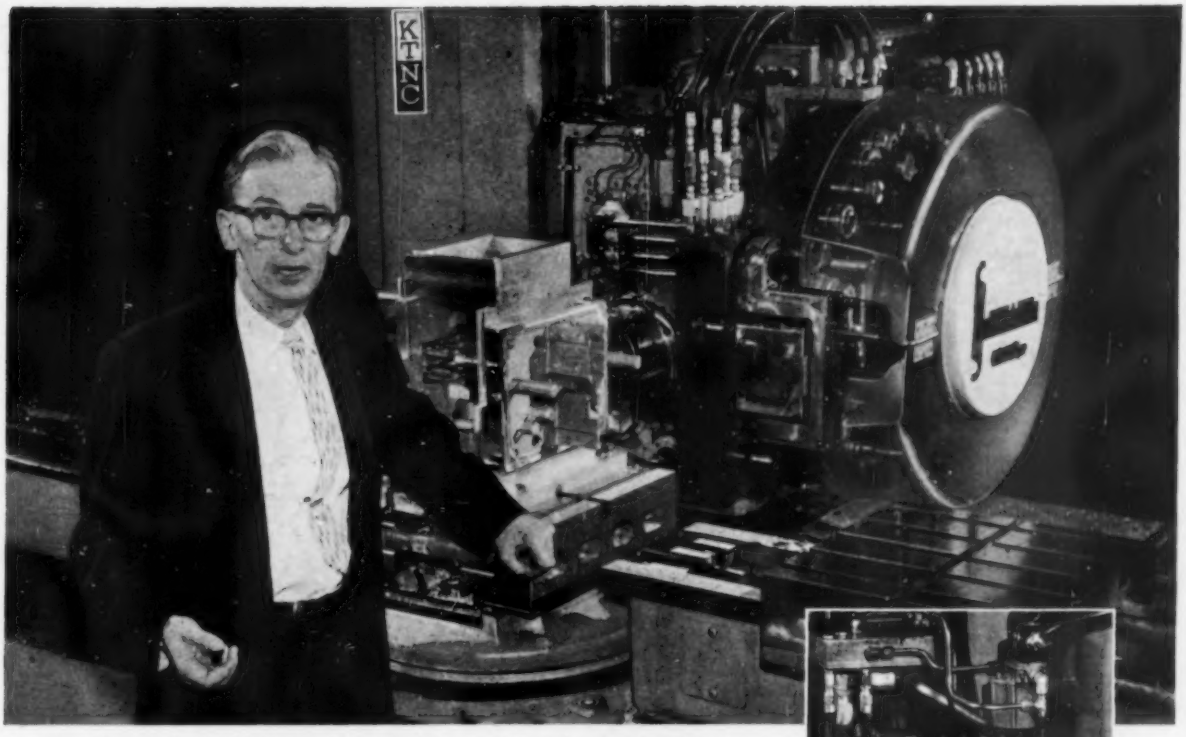

Mr. Julian Kerlin, Field Service Engineer for Kearney-Trecker Service Division, explains the contribution of Micro-Fog Lubrication to MILWAUKEE-MATIC reliability and ease of servicing.

Norgren Micro-Fog® Lubrication gives Kearney & Trecker greater flexibility in machine design

The new Kearney & Trecker tape-controlled MILWAUKEE-MATIC is an outstanding example of flexibility in modern machine design. In a single machine, the MILWAUKEE-MATIC performs all the operations of milling, drilling, reaming, tapping and boring that usually require several machines.

The Milwaukee-Matic is designed for maximum "chip time" and minimum set up and down time. This requires high reliability of operation and provision for rapid servicing.

This is why Kearney & Trecker engineers chose **Norgren** Micro-Fog for the lubrication system.

The Micro-Fog centralized air-borne lubrication system gives constant, reliable, metered lubrication at each bearing point. Alarm devices are connected to the control system of the machine to give warning of conditions affecting proper lubrication.

Micro-Fog is conducted to all bearing points through tubing, eliminating the need for cumbersome and costly return piping, oil filters, sumps and pumps. The result, as Kearney & Trecker found, is a wider latitude in machine design. With **Norgren** Micro-Fog, they were able to make maximum use of unitized construction in the MILWAUKEE-MATIC, providing for fast disassembly and component replacement.

This Norgren Micro-fog Lubro-Control Unit provides lubrication for the bearings on Kearney-Trecker's MILWAUKEE-MATIC, and for the slides, ways, gears and clutches in the head.

If you design machine tools which require measured, reliable lubrication of bearings, gears, slides, chains or ways, and want greater design flexibility, it will pay you to investigate Norgren Micro-Fog Lubrication. Write for detailed information, or call your nearby Norgren Representative listed in your telephone directory.

FOUNDED IN 1926

C.A. NORGREN CO.

3443 SOUTH ELATI STREET
ENGLEWOOD, COLORADO

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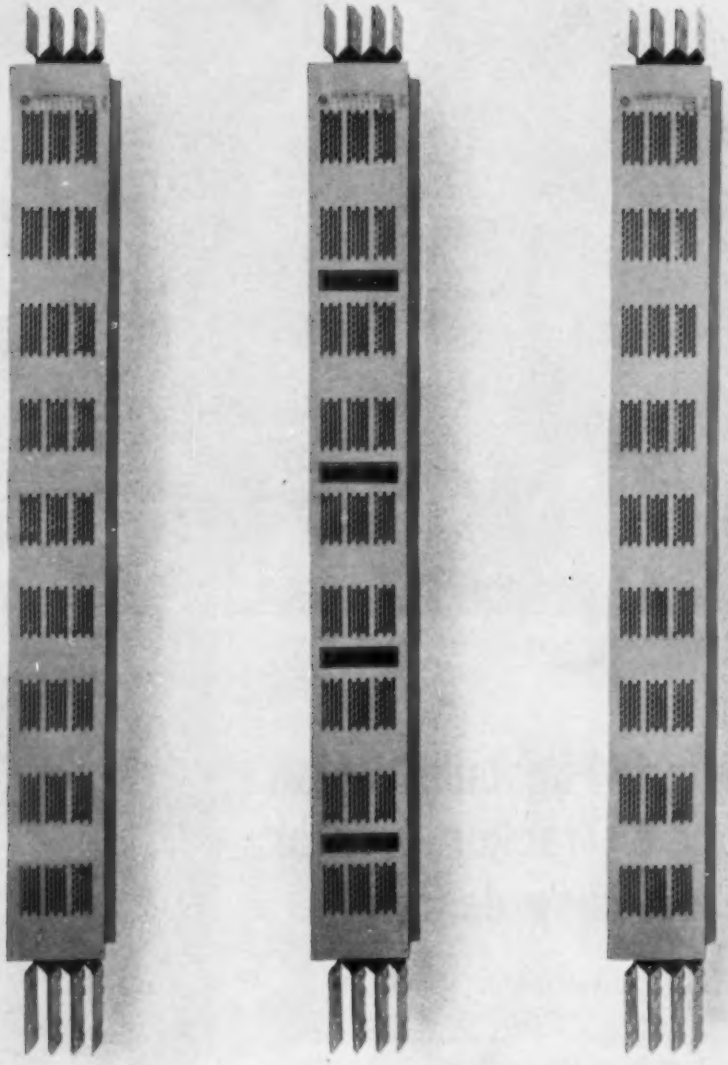
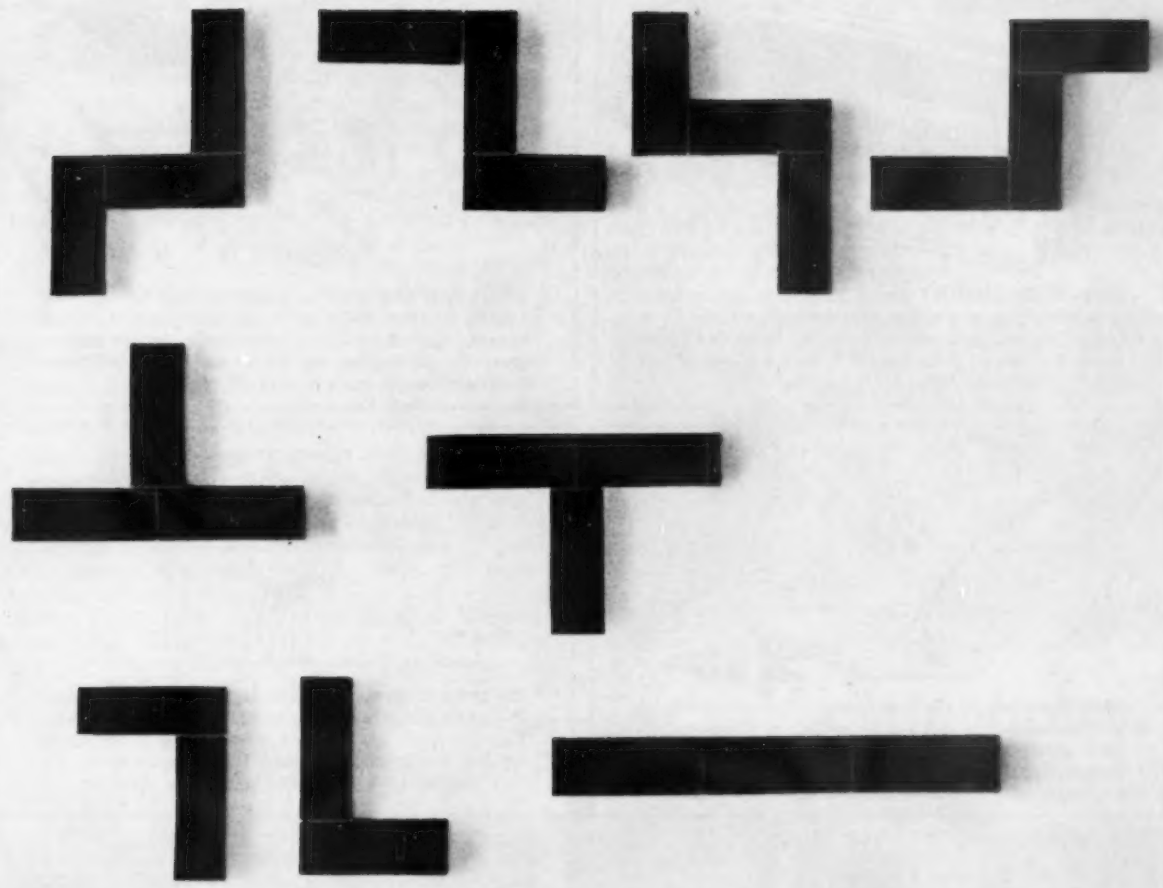


3 will get

Three straight lengths of FPE duct create all nine combinations shown – *right on the job.* Federal Pacific low impedance or low impedance plug-in ducts bolt together for tees, elbows and offsets in limitless application. And your savings are just beginning: no delivery delays... installation costs cut as much as 30%... flexibility and expandability multiplied several times over. What's



you nine

more, you can relocate in new layout, and again, no need to wait for factory fittings. All this because Federal Pacific designs bus duct on the modern modular principle, on all low-impedance, plug-in and weather proof duct. If you use duct – FPE is the only duct to use. Write for Bulletin 3-125, Federal Pacific Electric Company, Department FP-1, Newark 1, New Jersey

FEDERAL PACIFIC ELECTRIC COMPANY

FPE

growth through creative energy

DISTRIBUTOR DAN, the SKF bearing man, offers

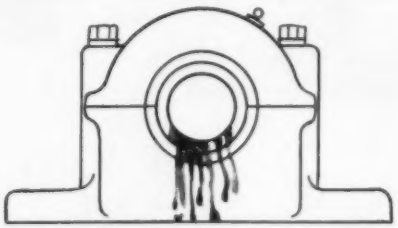
FIVE TIPS ON BEARING LUBRICATION

—that can save time and trouble for you

WHEN TO RE-LUBRICATE? Always follow the manufacturer's directions, if they're available. Most bearings, whether oil- or grease-lubricated, need cleaning and re-lubrication once a year. Re-lubricate oftener if the bearing is large, operates at high speeds or temperatures of 120-140 F. or higher.

WHAT GREASE CAN TELL YOU. Grease itself can tell you when cleaning and re-lubrication are needed. Dark grease means that oxidation has started or that abraded particles are present. Changes in the original color indicate water. Grease of a hard consistency should always be replaced.

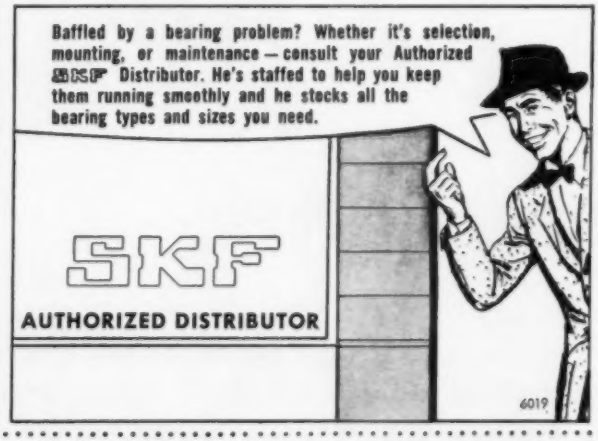
WHEN TO CHANGE OIL. Compare the oil in the bearing with unused oil. Clouded oil indicates water. Dark oil frequently indicates sediment. Dark, pitch-like coatings on the rings, roller ends or cage mean the oil has become dirty or begun to carbonize. So, clean the bearing and housing and re-lubricate.

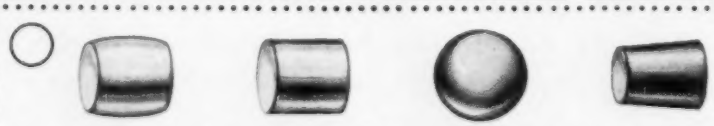


TOO MUCH IS WORSE THAN TOO LITTLE. Don't overlubricate. Only grease that actually contacts the bearing lubricates. Using too much grease may cause churning and lead to overheating and loss of lubricant. Remember: the higher the speed, the more sensitive a bearing becomes to excessive lubrication.

CLEANLINESS, FIRST AND LAST. Clean new oils and greases will usually force-out old lubricants in the bearings. But they won't if the lubricant is badly oxidized. Pour a hot aqueous emulsion into the housing. Rotate shaft until bearing is clean. Drain solution while rotating shaft. Then, flush with hot light oil, drain and add new lubricant.

Baffled by a bearing problem? Whether it's selection, mounting, or maintenance — consult your Authorized SKF Distributor. He's staffed to help you keep them running smoothly and he stocks all the bearing types and sizes you need.





Spherical, Cylindrical, Ball, "Tyson" Tapered and REED Miniature Bearings

EVERY TYPE—EVERY USE

SKF®

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

*REG. U. S. PAT. OFF.

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REWOUND MOTORS, INSULATED WITH SUPER COILIFE, ARE NO LONGER ORDINARY MOTORS

Exclusive epoxy encapsulation adds extra endurance, extra performance, extra life

These extra measures of rewind value—provided by Westinghouse Super COILIFE*—have been conclusively proved. For example, a Westinghouse motor stator, encapsulated with Super Coilife, spent 99 days at the bottom of Great Salt Lake. More than a quarter of this "water" is salt. This same stator was towed underwater by riverboat 1500 miles from Vicksburg to Pittsburgh. Neither of these strenuous trials-by-water had any detrimental effect on Super Coilife.

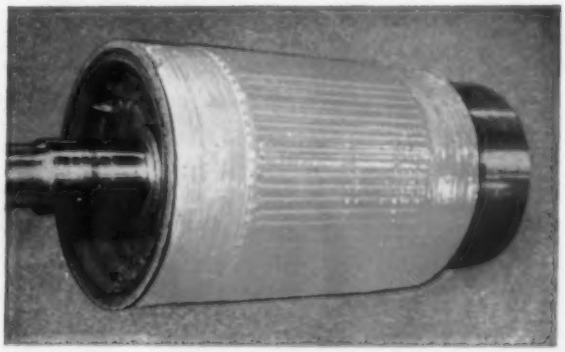
The extraordinary low viscosity of Super Coilife permeates slots and interstices, thoroughly protecting windings inside and out. The specialized application process also provides exactly the right "thin-wall" thickness for each type and class of winding for maximum heat dissipation. Moisture, acids, alkalis, oils and dirt are kept completely and permanently out with this solventless epoxy encapsulation.

Super Coilife has already proved itself in thousands of applications throughout industry such as paper, steel and food processing plants where high humidity is a factor; chemical, petroleum and coke processing plants with critical acid and alkali conditions; mining operations where abrasive matter is a problem; and utilities where fly ash is prevalent.

Super Coilife is an exclusive process of Westinghouse repair plants and can be applied to random wound stators, rotors and armatures. Call your Westinghouse representative for your next rewind job. He will explain the values of Super Coilife and the many other services provided by our repair plants. Write for booklet B-7622, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-95213

*Trade-Mark

The epoxy encapsulation of this rewound d-c armature offers effective and permanent protection to the windings. Exclusive polyester glass banding is part of the armature rewinding process by Westinghouse.



YOU CAN BE SURE...IF IT'S Westinghouse

TUNE IN WESTINGHOUSE-CBS TV-RADIO COVERAGE, PRESIDENTIAL CONVENTIONS, JULY 10-29

Super Coilife insulation was not affected by 99-day immersion in Great Salt Lake, Utah.

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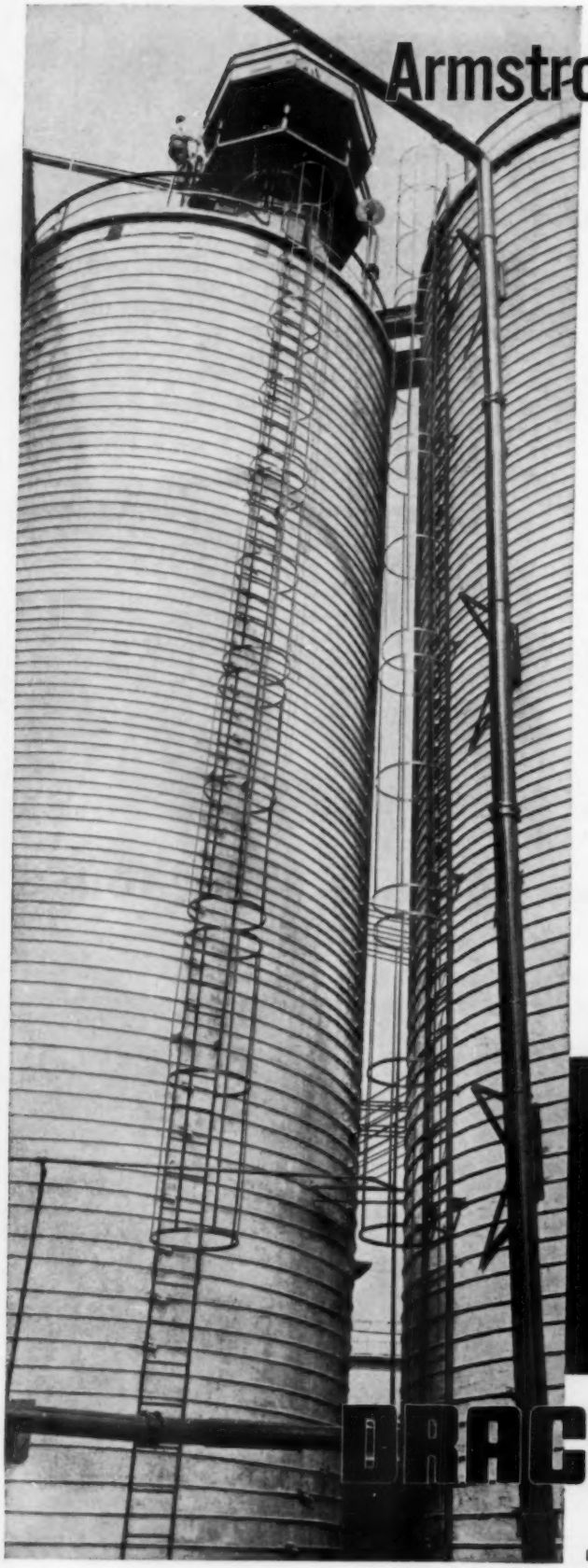

Armstrong Cork Co. goes *"up in the air"* to keep handling costs down

Automatic bulk handling with a Dracco Airstream Conveyor System provides a major assist in maintaining top quality, automated production at one of Armstrong's resilient flooring plants.

This plant is the world's most modern facility for manufacture of asphalt and vinyl-asbestos flooring tile. Airstream Conveying was chosen to furnish low-cost bulk handling in conjunction with other advanced processing techniques. The system unloads filler from boxcars, stores it, then moves it to process with only part time supervision of one man.

This is just one example of how economical air conveying helps industry gain more profits from automation. For full information on how Dracco can upgrade your materials handling, write: Dracco Division of Fuller Company, Harvard Avenue and East 116th Street, Cleveland 5, Ohio.

(left) Efficiency is raised here — Airstream Conveyor unloads material from boxcars to storage. Integrated system also moves material to process and permits use of gravity-flow techniques. (right) Bulk handling by remote control is advanced feature of ultra-modern plant. Airstream Conveyors adapt readily to automated processes.

DRACCO *airstream* conveyors
dust control equipment

FULLER COMPANY GENERAL

Photographs by the Armstrong Cork Co.

For more facts circle 587 on Reply Card

9:30 P.M.

Everything's under Control!

There's also an *unseen* maintenance worker on the job tonight. Robertshaw's unique Vibraswitch is monitoring malfunction on 24-hr. operating equipment...guarding costly air compressors and blower systems against the hazardous and expensive dangers of extensive breakdown. Everything's under control! Vibraswitch is the proven low-cost way to directly sense destructive vibratory forces in expensive rotating and reciprocating machinery. Instant reaction to changes in acceleration of machinery vibration with shut down, alarm and standby-actuation provisions. Should your expensive machinery break down, how costly will repairs be? Can you afford to be without low-cost Vibraswitch protection? In malfunction detection, level measurement or accurate handling of process ingredients, Robertshaw has a system for keeping "everything under control." Fifty convenient offices—write for name of the one nearest you.

ROBERTSHAW'S VIBRASWITCH
MALFUNCTION DETECTOR
IS ON THE JOB!

Aeronautical and Instrument Division, Robertshaw-Fulton Controls Company, Santa Ana Freeway at Euclid Avenue, Anaheim, California

Robertshaw
Mr. CONTROLS

MANUFACTURERS OF ROBERTSHAW CAPACITANCE-ACTUATED LEVEL MEASUREMENT INSTRUMENTS AND MICROSEN INDUSTRIAL PROCESS CONTROL SYSTEMS

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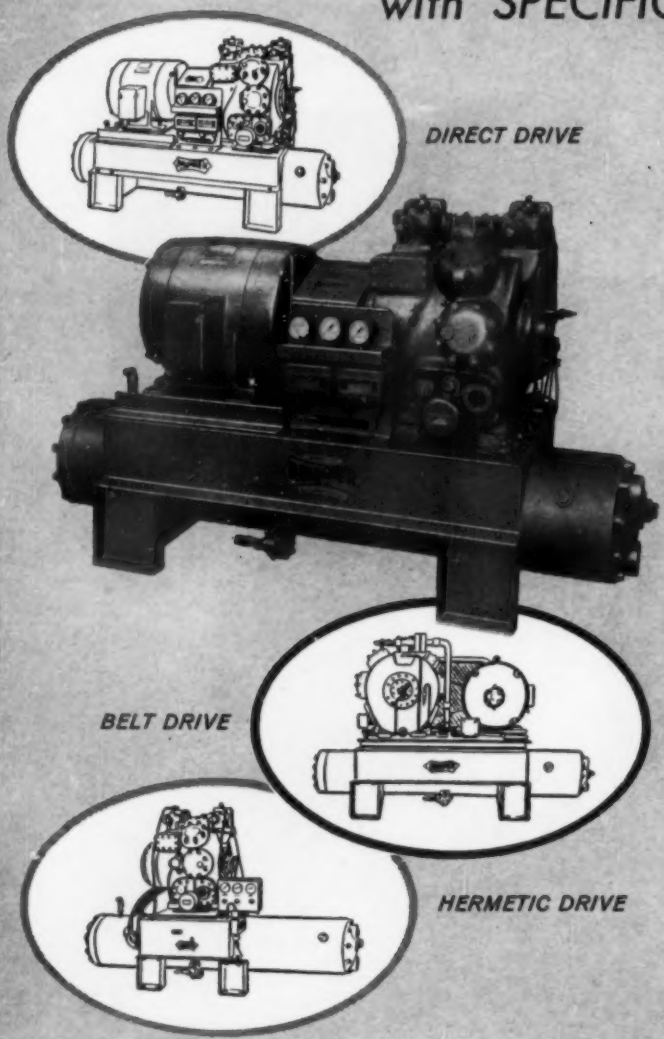
from **BRUNNER**
SINCE 1906

. . . Multi-Drive Compressors

with SPECIFICATION FLEXIBILITY



Again—from the leader—
a beneficial advance in compressor adaptability.

Brunner's new line of multi-drive units can fully satisfy *any* compressor requirement . . . providing a specification flexibility that substantially widens application latitude.

As illustrated, the line includes the direct drive model, the hermetically sealed model, and the belt-driven model. And to ensure the integrity of performance for which Brunner has been famous for fifty-three years, these units are constructed of only the highest grade materials; and are equipped with built-in capacity control, oil control valves, replaceable cylinders, and other important features.

The line's horsepower range is 7½-100. Each model is obtainable in either the water-cooled or the evaporative type.

For more information, contact the Dunham-Bush sales engineer near you, or write for Form No. 775.

Dunham-Bush, Inc.
WEST HARTFORD 10 • CONNECTICUT • U. S. A.

DUNHAM-BUSH
AIR CONDITIONING • REFRIGERATION • HEATING • HEAT TRANSFER

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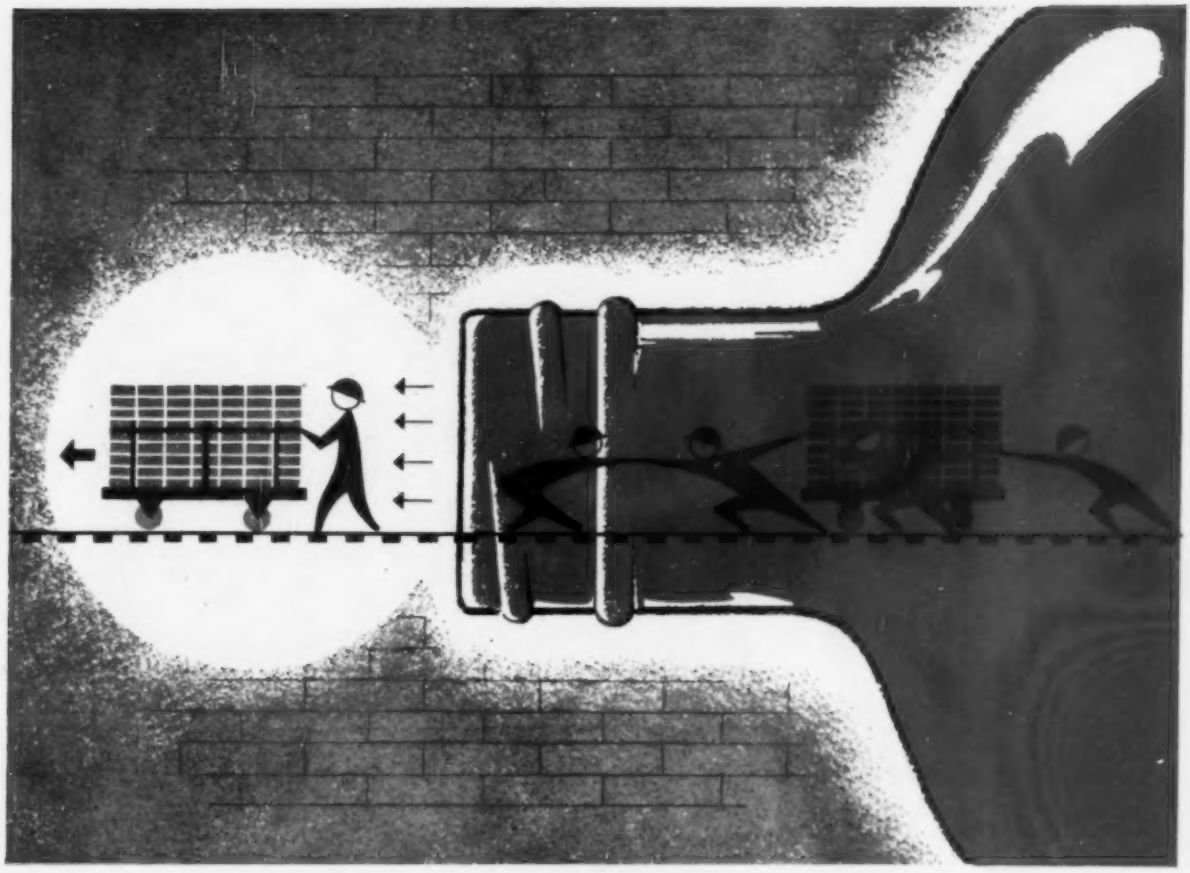


New "hot" grease ends brick-oven bottlenecks

. . . and one man outperforms four!

Ceramic Combustion & Engineering Company, consultants for the Davidson Brick Co., Los Angeles, California, ran into production bottlenecks while using ordinary grease in dryer-car bearings. Oven temperatures (350° to 400° F.) cooked the grease solid . . . stalled the cars loaded with bricks in the dryer. Bearings seized so badly that four men were needed to move each carload.

Now—with Shell Darina Grease 2 as the lubricant, Davidson reports: "Bearings roll free, even at 400° F., one man, instead of the four previously required, can *easily* roll a carload of bricks . . . no more bottlenecks caused by frozen bearings."

Darina® Grease 2 is an economical, multi-purpose grease with exceptional stability in high-temperature applications. It offers these outstanding qualities:

HIGH-TEMPERATURE PERFORMANCE. *100° F. better* than conventional multi-purpose greases.

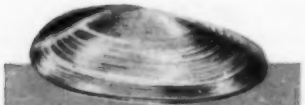
EFFICIENT SEALING. Contains no soap —nothing to melt and run out.

HIGH RESISTANCE TO WATER WASH-OUT. Doesn't dissolve or separate when mixed with water . . . lubricates efficiently under wet conditions.

POSITIVE RUST PROTECTION. Protects bearings even under severe moisture conditions.

ECONOMICAL. Savings up to 35% in grease and labor costs alone are possible because of Darina's superior performance over a wide range of plant operating conditions.

For more information on Darina Grease, write: Shell Oil Company, 50 West 50th St., New York 20, N. Y., or 100 Bush St., San Francisco 6, California. In Canada: Shell Oil Company of Canada, Limited, 505 University Avenue, Toronto 2, Ontario.



An Interesting Fact! Every Shell Branded Industrial Lubricant is named for a sea shell. Shown here: Darina solenoides.

SHELL DARINA GREASE

the multi-purpose, high-temperature grease

SHELL

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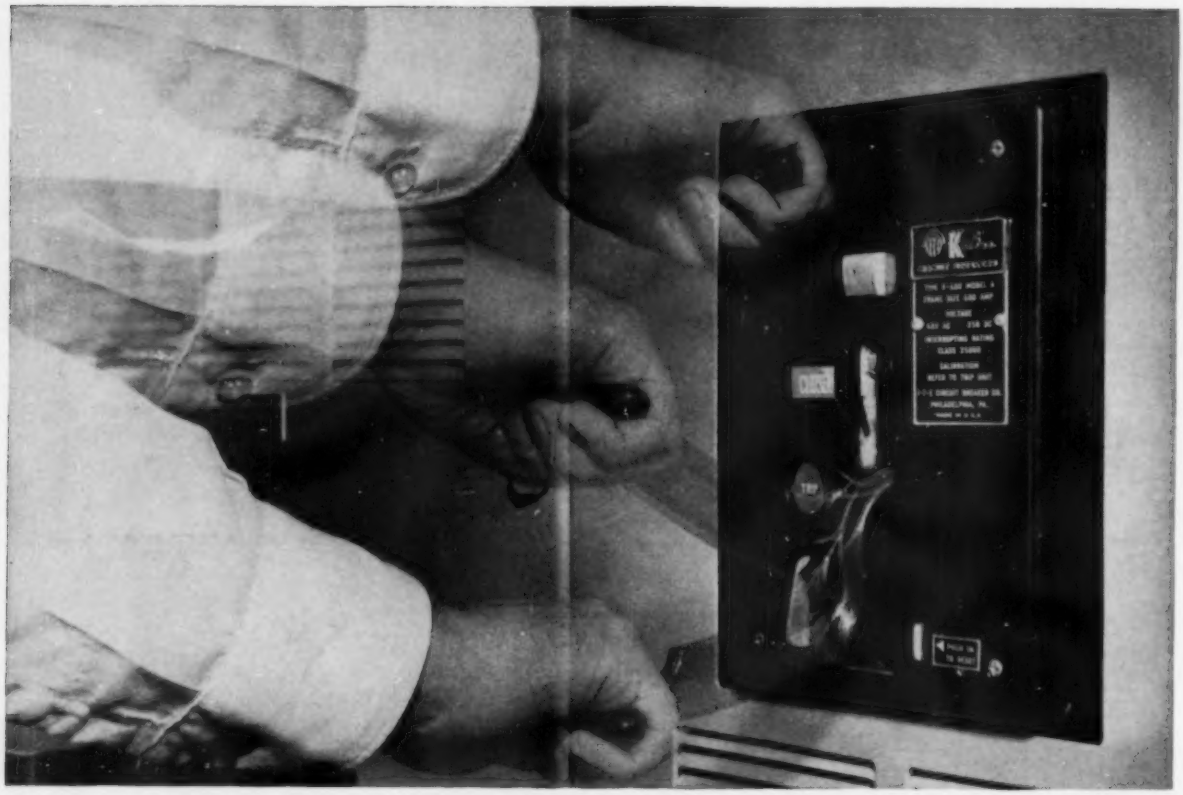

I-T-E started a revolution in 1957 when it introduced the completely new K-Line circuit breaker with stored energy closing. Today it is still the most advanced circuit breaker for low voltage switchgear you can buy.

ONLY I-T-E 600 V. SWITCHGEAR GOES BEYOND STORED ENERGY

GIVES YOU ADVANCES NO OTHER GEAR OFFERS

Closed door disconnect. A real safety feature. Operator can rack breaker out to either test or disconnect position without opening door. Prevents cluttered aisles from open doors and protruding breakers. And keeps breakers clean when they are disconnected.

Expanded range trip. I-T-E breakers can grow with your loads. Each trip device has roughly three to four times the range of conventional devices. Saves cost and downtime that replacement would demand. Easy to adjust. Calibrated directly in amperes.

You pay no more. That's right. With all these extra advances I-T-E low voltage switchgear costs no more. Send for detailed descriptive Bulletin 6004-C. I-T-E Circuit Breaker Company, Dept. SW, 1900 Hamilton St., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY

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For more facts circle 592 on Reply Card →

A beauty of a buy!

Whisper-quiet . . . extra power . . . wet or dry . . . light weight super capacity . . . you have your choice of all these *plus* in Black & Decker's vacuum cleaner line. The *plus* is a new heavy-duty, high-styled beauty that mounts on a pole, a wall, in bays—so light you can carry it with ease. The new No. 25 is designed especially for motels, hotels, offices, service stations and industry. Quietest commercial vacuum on the market. Priced to make it a real beauty of a buy from

Black & Decker®

Black & Decker Heavy Duty Vacuum Cleaners designed to suit your every need

Capacity plus Power . . . No. 95

Super-Capacity Cleaning . . . No. 55

Take the new No. 25 Heavy-Duty, for example. Here's *whisper-quiet* cleaning in a new concept of industrial vacuuming. The 25's swivel top permits cleaning a 15′ circle without moving the vacuum. And when the job's done just throw away the disposable bag! With power to spare the No. 25 is the most compact heavy-duty vacuum on the market.

Other models, ideal for general office, factory and furnace room use, are the No. 35 (⅛ bushel capacity); No. 65 for wet and dry cleaning; No. 95 for extra capacity and power. No. 55 for super capacity (50 gallons); and No. 648, designed for efficient furnace cleaning.

Whatever your cleaning needs call on B&D power, capacity, quietness. See the line soon. Mail coupon for free demonstration.

See Tools-Electric -Yellow Pages- for Service & Sales

THE BLACK & DECKER MFG. CO., Dept. 0805
Towson 4, Maryland (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of _____

☐ Please send additional information on _____

Name _____ Title _____

Company _____

Address _____

City _____ Zone _____ State _____

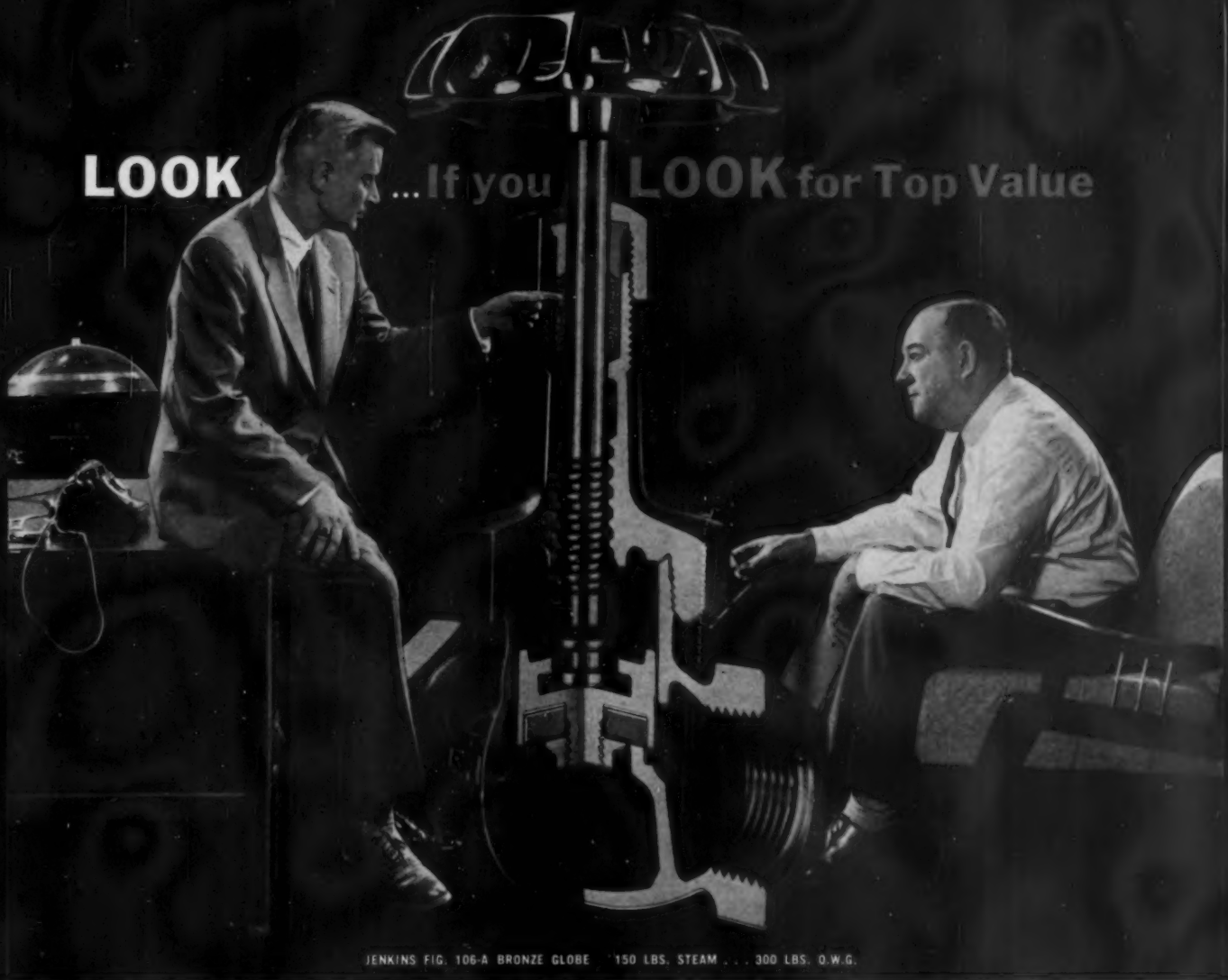
☐ Drills ☐ Saws ☐ Scruguns® ☐ Belt Sanders

50th YEAR

Leading Distributors Everywhere Sell

Black & Decker

QUALITY ELECTRIC TOOLS



JENKINS FIG. 106-A BRONZE GLOBE 150 LBS. STEAM . . . 300 LBS. O.W.G.

in Disc Equipped Bronze Valves

LOOK at that Wheel — Tough malleable iron. Design unequalled for cool, sure grip.

LOOK at the Index Plate — Has Fig. No. etched in green background. Held by wheel nut which is secured by rolled-over spindle end.

LOOK at that Spindle — Made of high tensile bronze. See how much heavier it is . . . how many more deeply cut threads engage bonnet. And, the crowned head that reduces friction on disc holder. Sure, it costs more to make a spindle this way. But it reduces wear, preserves packing, means easier operation.

LOOK at the Packing Nut and Gland—Note the heavy and deep bronze hex. And, that bronze gland designed to compress packing toward spindle.

LOOK at that Packing Box — Its depth equals 1½ times spindle diameter. More packing space means less repacking. An asbestos, lubricated and graphited packing is used.

LOOK at that Bonnet — One-piece, screw-over design with big hex surfaces is easy to remove. Take an extra look at the bevel joint between bonnet and body, serving as an internal brace against the crushing effect of the bonnet assembly. Millions of Fig. 106-A in use for years prove this unique design licks distortion and springing.

LOOK at the Disc Holder — It's the Slip-on Stay-on type originated by Jenkins. Correct protective depth prevents flaking or cracking of disc.

LOOK at the Disc — Easily renewed without removing valve from line. Made of compositions to suit various services . . . and **made by Jenkins**, the only maker of both valves and discs.

LOOK at that Body — Just compare wall thickness of this high tensile bronze body with any other valve. The factor of safety is many times higher than rating requires. See the curved diaphragm to protect seat from distortion by pipe strain. Note that the raised seat is higher to permit more reseating operations . . . and wider, so it won't cut into disc. Pipe threads are full length and clean cut.

LOOK at this . . . for Throttling

—Just replace the standard disc nut with this Throttling Nut and a Fig. 106-A becomes well-suited to throttling service. This unique nut reduces the effects of wire drawing and its long legs restrict flow for accurate control. Many plants take advantage of this versatile valve to reduce valve and parts inventory.

THE FIRST renewable composition disc valve was a Jenkins Valve, originated nearly a century ago. Compare today's Fig. 106-A Bronze Globe with any other. See why so many valve users agree that a *Jenkins* is still the FIRST for top value. For descriptive folder No. 189-B on the full line of Jenkins Bronze Globe, Angle and Check Valves write to Jenkins Bros., 100 Park Avenue, New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES

SOLD THROUGH LEADING DISTRIBUTORS EVERYWHERE

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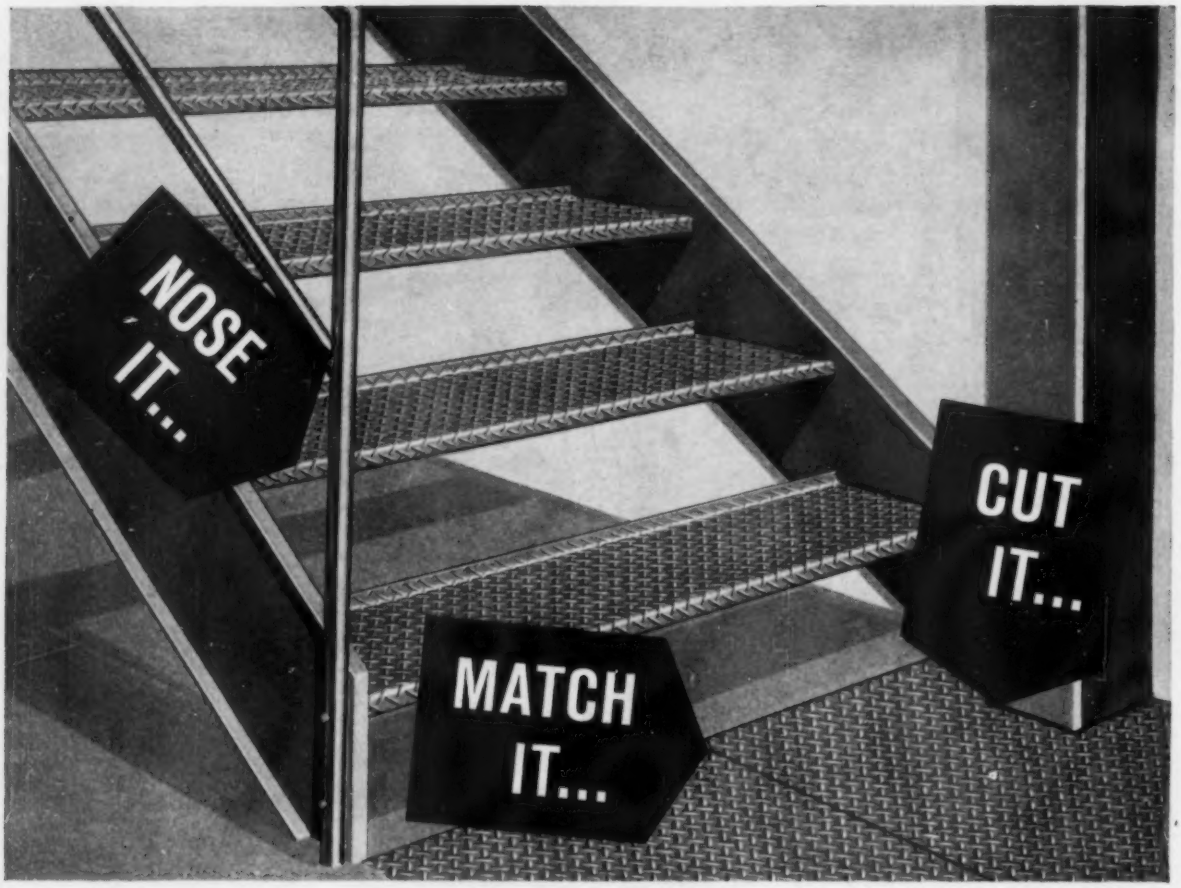

Alan Wood Super Diamond floor plate ...is easy to fabricate

Here's a heavy duty floor plate that can be sheared, formed, welded, and easily matched. The arrangement of the unique A. W. Super Diamond pattern allows you to bend it at any place.

A. W. Super Diamond will last for years... provides a safe, non-skid footing at all times. Easy to clean? A. W. Super Diamond can be swept, hosed or mopped easily . . . from any angle.

For easy fabrication and installation... for safety... for long wear ...specify A. W. Super Diamond. Write for Bulletin SD-S3.

ALAN WOOD STEEL COMPANY

Conshohocken, Pa. · STEEL PRODUCERS WITH THE CUSTOMER IN MIND

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver Canada: A. C. Leslie & Co., Ltd.

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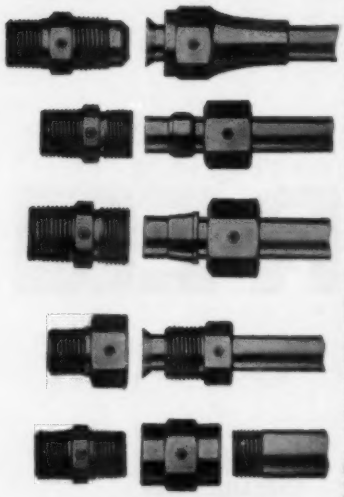
brass tube fittings



S.A.E. 45° FLARE
USE with copper, brass, aluminum, steel and plastic tubing. U.L. listed; A.G.A. approved. Meets SAE Hydraulic standards and A.S.A. and A.S.M.E. codes. PRESSURE RATING: up to 3000 p.s.i. Sizes: ⅛" to ¾".

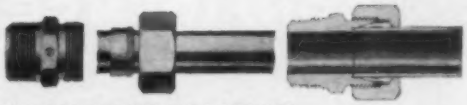
COMPRESSION
USE with copper, brass, aluminum and plastic tubing. U.L. listed; A.G.A. approved. Meets SAE Hydraulic Tube Fittings Standards and A.S.A. and A.S.M.E. codes. PRESSURE RATING: up to 2000 p.s.i. depending on O.D. of tube. Sizes: ⅛" to ¾".

SELF-ALIGN®
USE with copper, brass, aluminum and plastic tubing. No flaring, soldering, welding, or special tube preparation needed. PRESSURE RATING: up to 2000 p.s.i. Sizes: ⅛" to ¾".

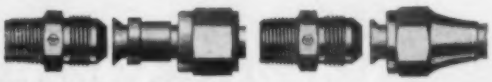
INVERTED FLARE
USE with copper, brass, aluminum, steel and plastic tubing. Meets SAE Hydraulic Tube Fittings and A.S.A. and A.S.M.E. codes. PRESSURE RATING: up to 3000 p.s.i. Sizes: ⅛" to ¾".

PIPE FITTINGS
USE with brass or steel pipe. Meets specifications of SAE TPHL Fittings Committee. PRESSURE RATING: up to 5000 p.s.i. Sizes ⅛" to ¾".

forged steel fittings



ERMETO HYDRAULIC TUBE FITTINGS
Most dependable high pressure fitting in the world . . . easiest installation. FOR FLARELESS TUBE SYSTEMS. No flaring, threading, welding or soldering. Available with carbon steel; stainless steel; cadmium plated or Weathercote finish. Standard Sizes: ⅛" through 2". Pressure Ratings: up to 10,000 p.s.i.

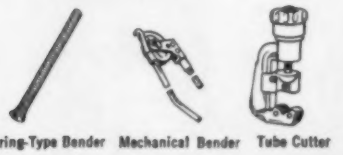


FLARE-TWIN HYDRAULIC TUBE FITTINGS
SAE 37° FLARE (J.I.C.) STEEL FOR FLARE TUBE SYSTEMS. No threading, welding or soldering. Two-pc. and three-pc. carbon and stainless steel with cadmium plated or Weathercote finish. Standard sizes: ⅛" through 2". Pressure Ratings: up to 10,000 p.s.i.

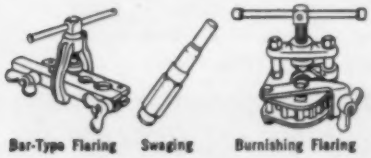
the WEATHERHEAD symbol is your assurance of SERVICE, QUALITY and DEPENDABILITY in all industrial hose and tube fitting needs

tube working tools

Designed to make fast, easy work of every tubing job. We offer a complete line of low cost, quality made tools for cutting, bending and flaring tubing up to ¾" in O.D.



Spring-Type Bender · Mechanical Bender · Tube Cutter



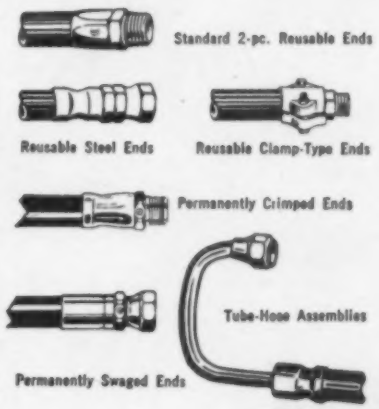
Bar-Type Flaring · Swaging · Burnishing Flaring

hose

Available in over 20 different types for any industrial application up to 10,000 p.s.i. pressures and sizes from ⅛" to 2" I.D. Five standard hoses meet most requirements.

H-9—Low Pressure
H-17—Medium Pressure
H-25—High Pressure
H-69—Medium High Pressure
H-108—Medium High Pressure

hose assemblies



Standard 2-pc. Reusable Ends
Reusable Steel Ends
Reusable Clamp-Type Ends
Permanently Crimped Ends
Tube-Hose Assemblies
Permanently Swaged Ends

YOUR SINGLE SOURCE SUPPLIER OF ALL INDUSTRIAL HOSE AND FITTINGS NEEDS

THE WEATHERHEAD CO.
FORT WAYNE DIVISION • **Dept. PL-7**
128 West Washington Blvd. • Fort Wayne, Indiana
In Canada: The Weatherhead Co., Ltd., St. Thomas, Ont.

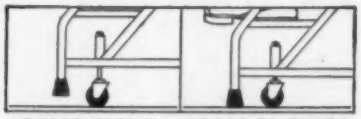
FOR DETAILS
See Weatherhead catalog in Sweet's Product Design File, Plant Engineering File, the Fluid Power Directory, or write direct.

For more facts circle 595 on Reply Card

GO UP WITH CONFIDENCE ON

BALLYMORE

Safety-Step LADDERS



Now...Ballymore combines welded steel or aluminum safety treads with wide-base pyramid design to offer extra safety and stability. Ballymore ladders let you climb quickly . . . and with confidence—any required height up to 15 feet. Spring-mounted casters that retract when you step on the first step is another safety "plus." They let you roll the ladder easily, yet grip the floor surely to provide safety at all levels.

All welded, corrosion-resistant Ballymore Safety-Step Ladders are available in four types—with 47 models to choose from. Step up to a new standard of safety today.

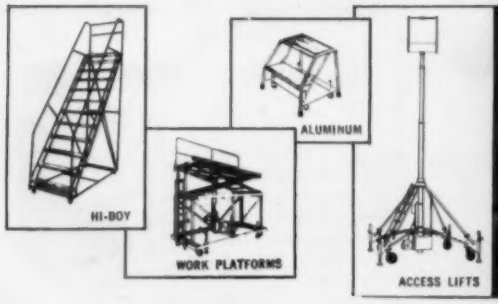
WITH HANDRAILS

WITHOUT HANDRAILS

CALL YOUR LOCAL DISTRIBUTOR TODAY

Ballymore SAFETY LADDERS

WRITE TODAY—Send for free illustrated catalog of complete line of Safety-Step Ladders for every requirement. Ballymore Company, West Chester 29, Pa.



BALLYMORE

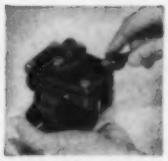
EQUIPMENT FOR WORKING *Safely* ABOVE FLOOR LEVEL

For more facts circle 596 on Reply Card

For more facts circle 597 on Reply Card →

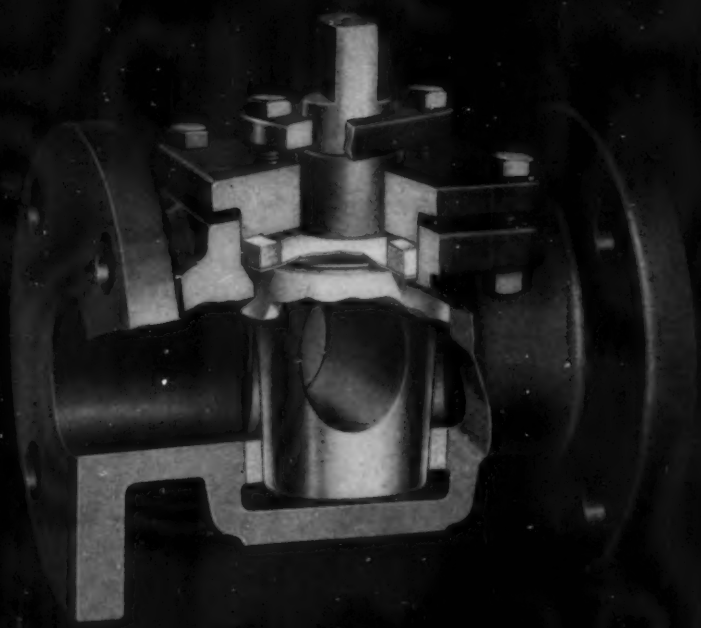
Put a Teflon® sleeve in the body insert a plug

add a diaphragm, a gasket and a thrust

collar, secure the cap and the  self-aligning adjuster,

and you've got a non-lubricated, trouble-free plug valve.

This is the new Type G **DURCO SLEEVELINE**



ductile or stainless
screwed or flanged
1/2" to 2" sizes

ductile flanged
sizes to 6"

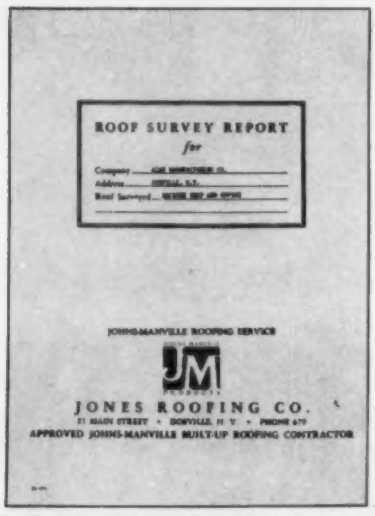
150 psi rating
write for Bulletin V/12

DURCO

THE DURIRON COMPANY INC., Dayton, Ohio / Valves • Pumps • Filters • Process Equipment

What these trained eyes see may save you thousands of roofing dollars!

YOUNG ROOFING CO., ST. LOUIS, MO.



ABSOLUTELY WITHOUT OBLIGATION— *a detailed report like this covering your roof and what it needs now or later.*

Let a Johns-Manville approved roofing contractor make the report for you... without the slightest obligation

It takes a practiced eye to spot roof troubles that may cost you thousands of dollars later. The approved Johns-Manville Roofing Contractor near you can locate trouble before it happens . . . and knows what to do about it.

A J-M Roof Survey—available to you without obligation—covers visible defects. More important, it points out future troublesome spots. And it shows you clearly and concisely what to do and what it will cost using quality Johns-Manville Roofing Products . . . and the services of your J-M contractor.

Put his trained eyes to work on your roof today. He's listed in the Yellow Pages under "Roofers." Or write Johns-Manville, Box 158, Dept. PE-7, 20 E. 40th Street, New York 16, New York.

JOHNS-MANVILLE

J-M 7★ 7 STAR VALUE PRODUCTS

For more facts circle 598 on Reply Card

FOR SAFETY YOU CAN SEE REMEMBER THE "V" FOR VISIBLE BLADES!

• The men who pull the switches will tell you what can happen when a switch, *believed* to be open —*isn't*. A lot of things can happen—and every one of them is bad. Personnel safety is in jeopardy. Motors can single-phase. Machinery and work can be damaged. Down-time can skyrocket.

Doesn't it make sense to insist on Visible Blade construction which gives you a road block against any of those possibilities? Doesn't it make equally good sense to insist on the safety switch which gives you that construction—plus a lot of other performance advantages? Evidently it does, because *Square D switches have never been out of first place in more than 50 years!*

They cost no more... why settle for less?

MAIL the coupon for latest Safety Switch Bulletin

Square D Company, Dept. SA-111
1601 Mercer Road, Lexington, Kentucky

Please send me your latest SAFETY SWITCH BULLETIN

NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

SQUARE D COMPANY

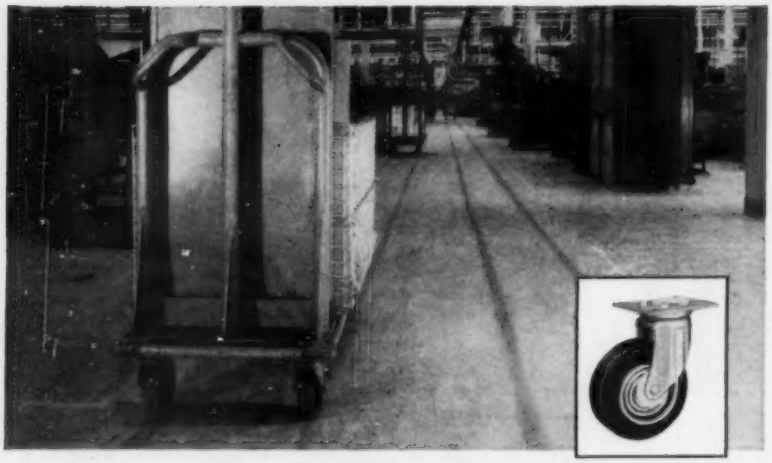
wherever electricity is distributed and controlled

For more facts circle 599 on Reply Card

MATERIALS-HANDLING NEWS

NEW AND UNUSUAL APPLICATIONS OF BASSICK CASTERS THAT MIGHT BE ADAPTED TO YOUR HANDLING PROBLEMS

How drag-line trucks on Bassick Casters save money at Western Electric



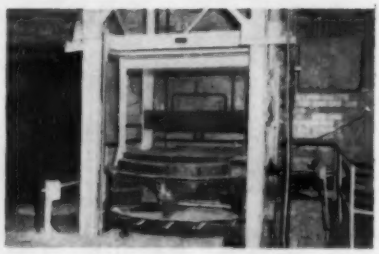
At Western Electric's Andover plant in Massachusetts, trucks on a continuous drag-line route deliver materials and remove finished parts at a steady 1½ mph. Carts can be automatically switched from main conveyor route to stop at any department—as needed. Simplicity of operation and easy movement through manufacturing process adds up to materials handling economy.

Built for rough service

Brings quiet, easy swiveling action to some of industry's *roughest* caster applications. Popular for both general factory use and in warehouses, stores and institutions. Case-hardened bearing surfaces and specially formed structural steel shapes combine to deliver the economical values of long wear and extra strength. Projection welded oversize ball raceways add to service life. Wide range of wheel sizes and types make Series H-99 useful for many needs.

A GOOD MAN TO KNOW!

Local industrial distributors who handle Bassick casters can advise you on specific casters that will best solve your materials handling problems. They stock popular models.

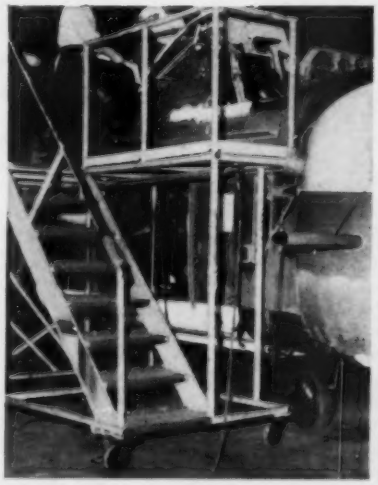


Automatic Conveyor at Bowaters Southern Paper Company, Calhoun, Tenn.

This vertical paper conveyor moves on 8 Bassick Casters

The Lamson Corporation, designers of this automatic conveyor system, points out that there can be no unimportant parts because failure of any one would shut down the entire mill. Eight Bassick Swivel Casters, Series "77," provide vital movement for the conveyor that loads and unloads itself, revolves, tilts and shuts itself off. It moves rolls of newsprint that weigh up to 2,500 pounds, and is part of in-plant distribution system between production floors, storage and truck, rail and barge transportation. This is typical of the way Bassick Casters help resolve key materials handling problems by helping to move finished products as well as parts, equipment and raw materials.

Bassick Casters help hatch Whirlybirds



Men at work on rotor head of another Sikorsky helicopter at Stratford, Connecticut. Notice how Bassick levelizing jacks hold the maintenance stand still and rigid while work proceeds. Later, it will roll easily away on its 8-inch, Series 77 Bassick casters.

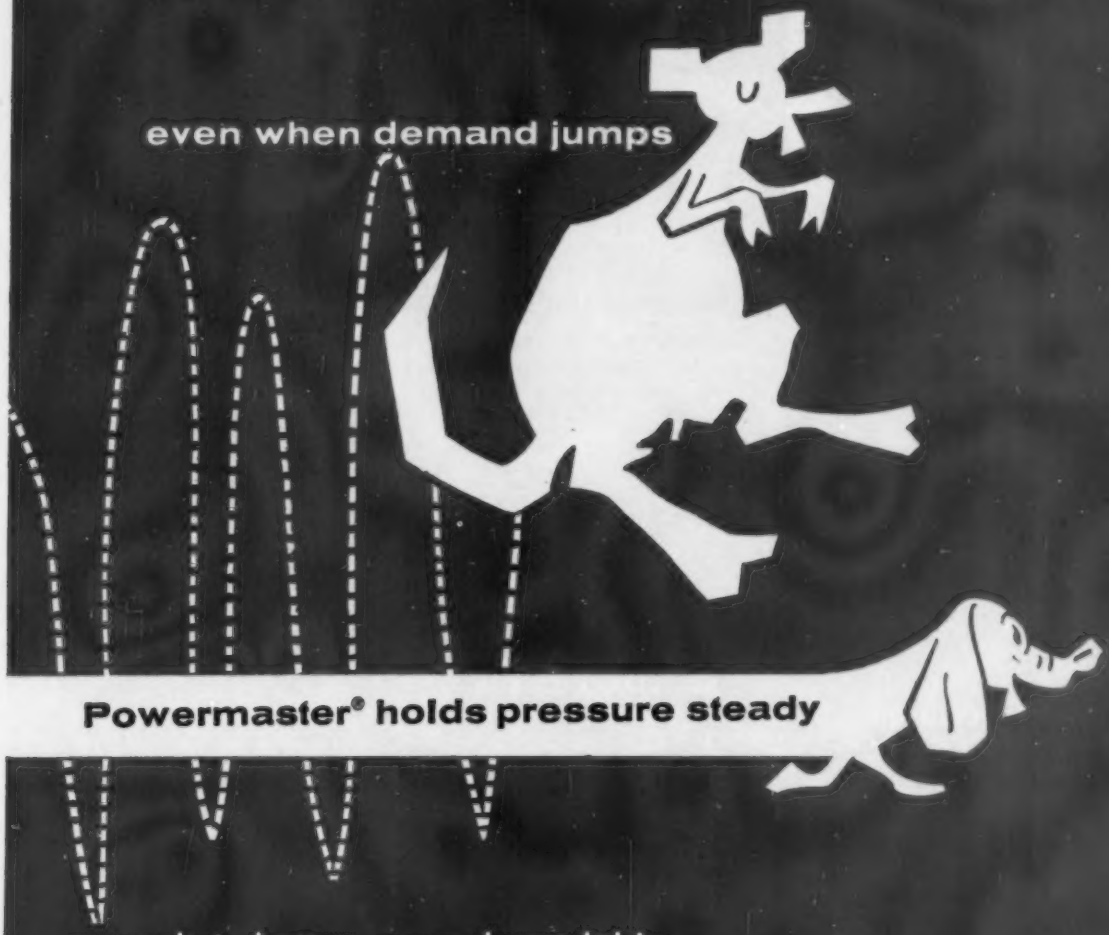
0.32

THE BASSICK COMPANY
BRIDGEPORT 5, CONN.
IN CANADA:
BELLEVILLE, ONT.

Symbol of SW Excellence
Bassick
A DIVISION OF
STEWART-WARNER CORPORATION

For more facts circle 600 on Reply Card

FROM THE WORLD LEADER IN PACKAGED AUTOMATIC BOILERS AND BURNERS



Powermaster® holds pressure steady

...result is better, more dependable processing. This is only *one* reason why *Powermaster* outperforms any other boiler at less cost. Want proof? Call your nearest O&S representative or write direct for Bulletin 1260.

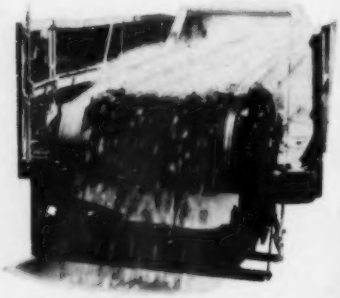
75th Anniversary

ORR & SEMBOWER, INC.
840 Morgantown Road
Reading, Pa. • Since 1885

Powermaster®
PACKAGED AUTOMATIC BOILERS

For more facts circle 601 on Reply Card

WHEN YOU NEED RESILIENCE PLUS...

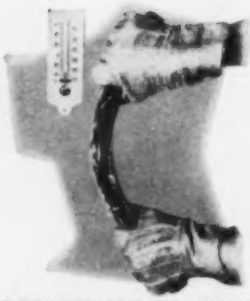


RESISTANCE TO HEAT

A million tons of hot coke have not harmed this neoprene belt.

RESISTANCE TO FLAME

Neoprene coated firewalls for aircraft pass this flame thrower test.



RESISTANCE TO COLD

Neoprene remains flexible even at –65° F.

RESISTANCE TO OIL

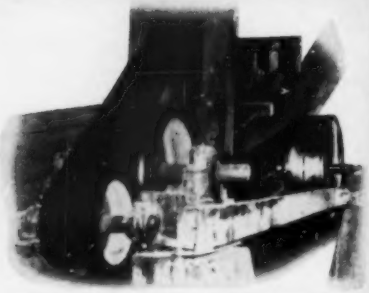
Neoprene retains its properties in contact with oil and grease.

RESISTANCE TO SUN AND WEATHER

After 25 years' exposure, neoprene cable (bottom) shows no surface cracking.

RESISTANCE TO OZONE

Neoprene tire sidewalls resist ozone cracking.

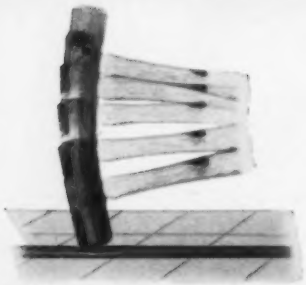


RESISTANCE TO ABRASION

Tough neoprene gives dependable service in severe applications.

RESISTANCE TO CHEMICALS

Neoprene assures protection against most acids and chemicals.



RESISTANCE TO IMPACT

Neoprene has outstanding resilience, resists permanent distortion.

SPECIFY VERSATILE DU PONT NEOPRENE

synthetic rubber

A quarter century of industrial service has proven that versatile Du Pont neoprene, with this balanced combinatiçn of properties, can meet a range of severe service requirements. Neoprene products are available from rubber goods manufacturers and distributors. For additional information, write E. I. du Pont de Nemours & Co. (Inc.), Elastomer Chemicals Department P-7, Wilmington 98, Delaware.

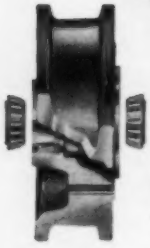
DU PONT REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

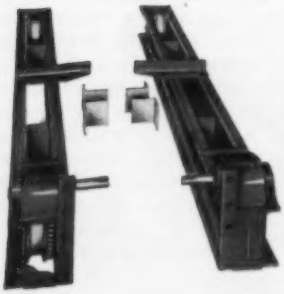
NEOPRENE MAKES TODAY'S PRODUCTS BETTER . . . TOMORROW'S PRODUCTS POSSIBLE

For more facts circle 602 on Reply Card

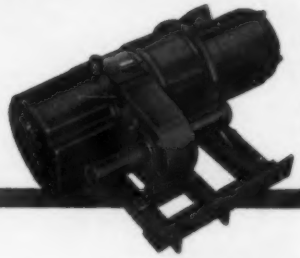
It Costs Far Less to Build a Crane Locally from Wright Matched Components!



TREAD WHEELS
Made of special car wheel iron with the tread deep chilled to a hardness of 450-500 Brinell. Tapered tread is self-aligning.



END TRUCKS
Welded steel channel construction with heavy steel plate diaphragms. Squaring shaft of ground and polished steel.



CRANE DRIVE UNIT
Consists of electric motor and well-proportioned gear reduction. Solenoid "drag" brake. Size 1—motors up to 2 HP. Size 2—3 or 5 HP motor.

• Now, buy a dependable WRIGHT B-514 Top Running Single Bridge Crane the modern, money-saving way! Here's all you do! Instead of paying shipping costs on a complete crane, order only the matched components—from your nearby WRIGHT distributor. Then, buy heavy I-beam structurals from a local source. This way you realize big savings by greatly reducing freight charges. WRIGHT furnishes an information sheet showing structural components which can be bought locally to complete the assembly.

A FEW OF THE WRIGHT B-514 FEATURES:

Controls • Single-speed push button controls are furnished with fluid-drive models, variable-speed push button controls with models without fluid drive. Variable speed controls have five selective speeds for speeding and slowing crane travel.

Fully Integrated Electrical Controls for the B-514 assembled locally with a WRIGHT Hoist and WRIGHT Crane Drive Unit are factory-installed at no extra charge.

Two Timken Roller Bearings to each wheel. Placed in opposition to one another, they compensate for radial and thrust loads.

GET IN TOUCH WITH YOUR WRIGHT DISTRIBUTOR

If you do not have his name, please write our YORK, PA., office and we will send it to you.

WRIGHT CRANES

Wright Hoist Division • American Chain & Cable Company, Inc.

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

For more facts circle 603 on Reply Card

ACCO

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

Reader Service Post Cards for requesting more details on products described are provided on pages 245-246.

WIRE ROPE SLINGS are flexible enough to knot

Intended for applications where ease of handling is all important, Hi-Pli, a new series of ACCO Registered Preformed Cable-Laid Slings, are designed to offer the flexibility and non-kinking advantages of hemp rope

plus the strength of steel. Constructed from a combination of specified number of individual wire ropes and laid around a steel center core, Hi-Pli Slings are said to be so flexible that knots can be tied into them without harm. They are coated with a bright galvanized Galacco finish. In 12 rope diameters from 9/32 to 2 in., the ropes have breaking strengths ranging from 3 to 113 tons. American Chain & Cable Co. Inc.

▲ For details, circle 1 on Post Card

PACKAGED CONDITIONERS are self-contained, high capacity

For heavy duty use, PAC Air Conditioners are announced as ruggedly constructed, attractively finished, and for installation either within conditioned area or at a remote location. Panel-type casings are Fiberglas insulated and finished in hammertone blue-gray enamel with vinyl paint undercoating. Available in five sizes from 10 to 30 hp, the units are compact, quiet in operating and easily adapted (in the field) for connection to duct work, manufacturer points out. Larger units have dual compressors. The 10-and 15--hp models are available with free air discharge plenum and may be had with steam coils in the plenum. All can be used with steam coils in the duct system and can have fresh air inlets. Bulletin 6022 gives data. Dunham-Bush, Inc.

▲ For details, circle 2 on Post Card

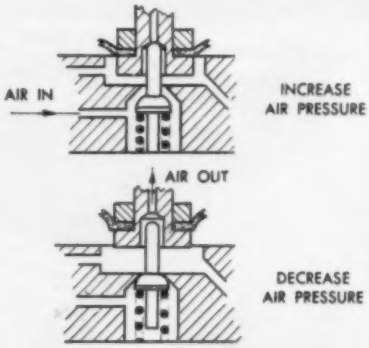
PLASTIC MATERIAL repairs floor cracks right away

Revco Crack-Fix is a finely-ground, plastic-based aggregate for repairing cracks, expansion joints, openings, separations or shallow holes in concrete, asphalt and wood floor surfaces. To use, you clean out the defect with brush or broom, apply primer (not necessary for thin or deep, narrow cracks) will with Revco Crack-Fix and tamp in. It sets immediately, company states, and traffic can roll without delay. The material comes ready for use on interior or exterior surfaces. Revere Chemical Corp.

▲ For details, circle 3 on Post Card

MACHINERY MOUNT for the precision applications

Serva-Levl Mount is claimed to maintain level within 0.0005 in. per foot of length, regardless of load, with repeatable accuracy better than 0.1 per cent. Basically a pneumatic servo-



mechanism, the mount slides under the support points of the equipment. Levelling is by Allen wrench adjustment. Operating from a standard plant air supply, the mount is designed to compensate automatically for changes in loading, variations in floor level due to changes in foundation rigidity, external and internal thermal changes. At the same time, it isolates vibration and shock, since the mounted equipment is supported on a cushion of air.

Variations in loading of supporting plate are sensed by the intelligence unit. An increase in load opens the valve to the air supply, increasing air pressure within the mount enough to compensate for the changed loading. A decrease opens the other end of

(Continued on page 208)

BREAKERS, SWITCHGEAR offer safety, improved performance

This 4160-v equipment includes circuit breakers and switchgear re-designed "from the ground up" to provide improved fault protection, increased safety for personnel and equipment, high reliability, and simpler installation and maintenance. The breakers are reportedly the first to combine stored-energy closing and ironless blowout in this voltage rating. The stored energy closure utilizes a motor-charged, spring-powered mechanism to provide faster closing of contacts, and improve contact life, as well as afford greater safety. Ironless blowout provides a reduction in arc chute weight for easier handling and faster fault interruptions through improved arc extinction afforded by better magnetic field distribution. Also featured are light weight, compact size.

Switchgear construction incorporates reduced size, rugged construction, and improved bus and wiring design. A major advantage is closed-door drawout, with movement from operating to test and disconnect positions accomplished while door remains closed. Besides increasing personnel safety, this keeps aisles free of open doors. Closed door indication is a feature—opening a small sliding panel near the floor reveals indicator showing breaker position. (Indication of breaker contact status-open or closed-is also visible with door closed.) Easy

access to current transformers is provided. Transformers can be removed from front of board without disturbing bus. I-T-E Circuit Breaker Co.

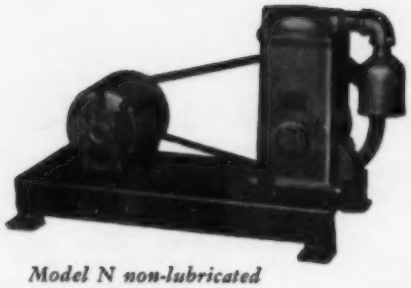
▲ For details, circle 4 on Post Card

is your compressed air problem an oily one?

If so, see the leading air compressor manufacturer —Ingersoll-Rand. For *oil free compressed air* applications in food, chemical, combustion or process control, packaging, laboratory work, etc., small I-R non-lubricated compressors may be the answer.

Ingersoll-Rand non-lubricated units feature pistons fitted with patented graphitic-carbon rings that prevent contact of the piston and cylinder bore. These segmented rings with metal expanders have the correct bearing pressure against the cylinder wall. Metal to metal contact is eliminated and no lubricant is required in the compressor cylinder. The crank case is lubricated but oil cannot pass the crosshead portion that is equipped with seals and oil control or scraper rings.

Why not have an experienced Ingersoll-Rand air engineer or distributor help you solve your problems.

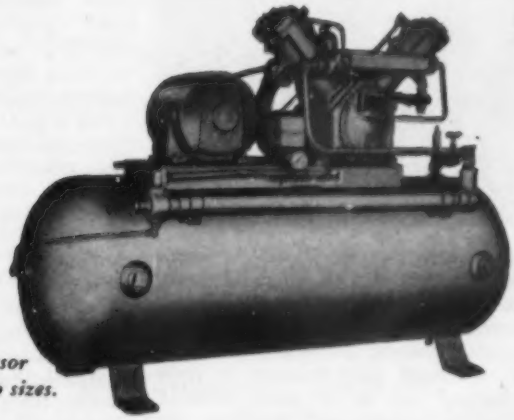


Model N non-lubricated compressor available in ½, ¾ and 1 hp sizes.

Model 23ANL non-lubricated compressor available in ¾, 1 and 1½ hp sizes.

Ingersoll-Rand

84A3 11 Broadway, New York 4, N. Y.



Model 235HNL non-lubricated compressor available in 2 and 3 hp sizes.

Larger I-R Reciprocating Compressors are available in non-lubricated design.

For more facts circle 604 on Reply Card

NEW PRODUCTS

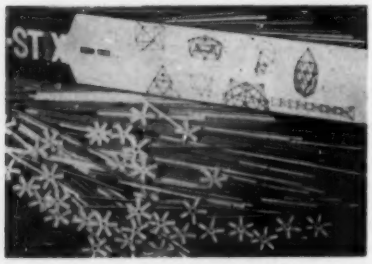
(Begins on page 206)

the valve, bleeding off enough air pressure to maintain level. A damping orifice within the pneumatic system serves to prevent abrupt changes. Units may be operated individually, or several may be "slaved" to a single intelligence source. Barry Controls.

▲ For details, circle 5 on Post Card

CONSTRUCTION KITS for making structural mock-ups

D-Stix Kits can be used to mock up girders, towers, trusses, framework etc., or to make models or form molecular structures. The kits consist of colored wood sticks and rubber

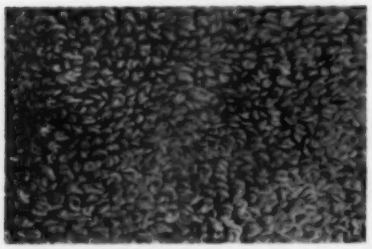


joints in two types: universal, and a T-type which lets the sticks pass clear through. They come in three sizes containing 230, 370 and 452 pieces. The smallest size costs around $3.00. Edmund Scientific Co.

▲ For details, circle 6 on Post Card

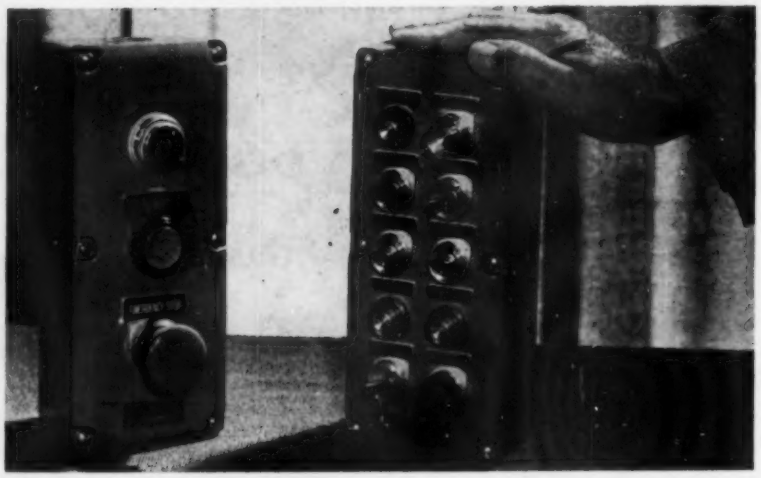
FABRIC FILTER MEDIUM has unusual selective qualities

For plants using filter presses or vacuum and pressure filters, Terri-Cord offers innumerable filtering surfaces within a small filtering area. It's



made of cotton fabric with hundreds of tiny knitted loops per square inch. Reported particularly effective in manufacture of chemicals and in dust control systems, Terri-Cord is claimed to withstand great pressure, to resist clogging and to be easily cleaned. Various weights and porosities are available. Advance Glove Mfg. Co.

▲ For details, circle 7 on Post Card



MINIATURE PUSH BUTTONS take up less panel space

Reductions in panel space of at least 40 per cent are claimed possible with these miniature industrial oil-tight push button units. Because of their smaller size—about half that of existing heavy-duty push buttons—these units require only a 7/8 in. diam mounting hole and may be as close as 1¼ in. apart. The photograph shows an installation of ten of them (right) in the same standard box holding three conventional units.

In spite of their size reduction, the new units are said to offer mechanical and electrical life equal to company's heavy-duty oil line (within ratings) and the same operating and functional forms. These include push buttons (with or without guard); mushroom head buttons; selector switches; illuminated push buttons; illuminated mushroom head buttons; transformer-type indicating lights; and push-to-test indicating lights. Retaining rings in six colors permit easy color coding and engraved or blank nameplates are available in two sizes. Illuminated forms come in six colors, and an encapsulated transformer for the lights has separate, insulated secondary winding for added protection.

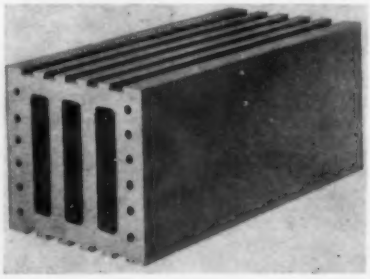
Manufacturer says that all of the miniature units are suitable for use where cutting fluids and coolants are present, or in dirty environments, and that the line meets applicable NEMA, NMTBA and JIC standards. These units are rated at 150 v a-c. General Electric Co.

▲ For details, circle 9 on Post Card

LOCKSETS, DOOR CLOSERS withstand corrosive atmospheres

Heavy-duty cylindrical locksets and rack and pinion door closers, both of corrosion-resistant stainless steel construction, are intended for installations where corrosive effects are encountered. They are suggested for plants near large bodies of water and those involving exposure to corrosive chemicals, as well as for specialized areas within a plant. In the locksets—Series 5500—all parts, including latch unit, body and trim, are heavy gage stainless steel. They come in five designs, 25 functions for special purposes. (Additional designs are possible through use of interchangeable exterior trim from company's Series 5400 locksets.) Door closers—Series 80— have full rack and pinion mechanism, two-speed closing adjustment, adjustable back check. They have a slender horizontal silhouette to harmonize with modern building styling. The Yale & Towne Mfg. Co.

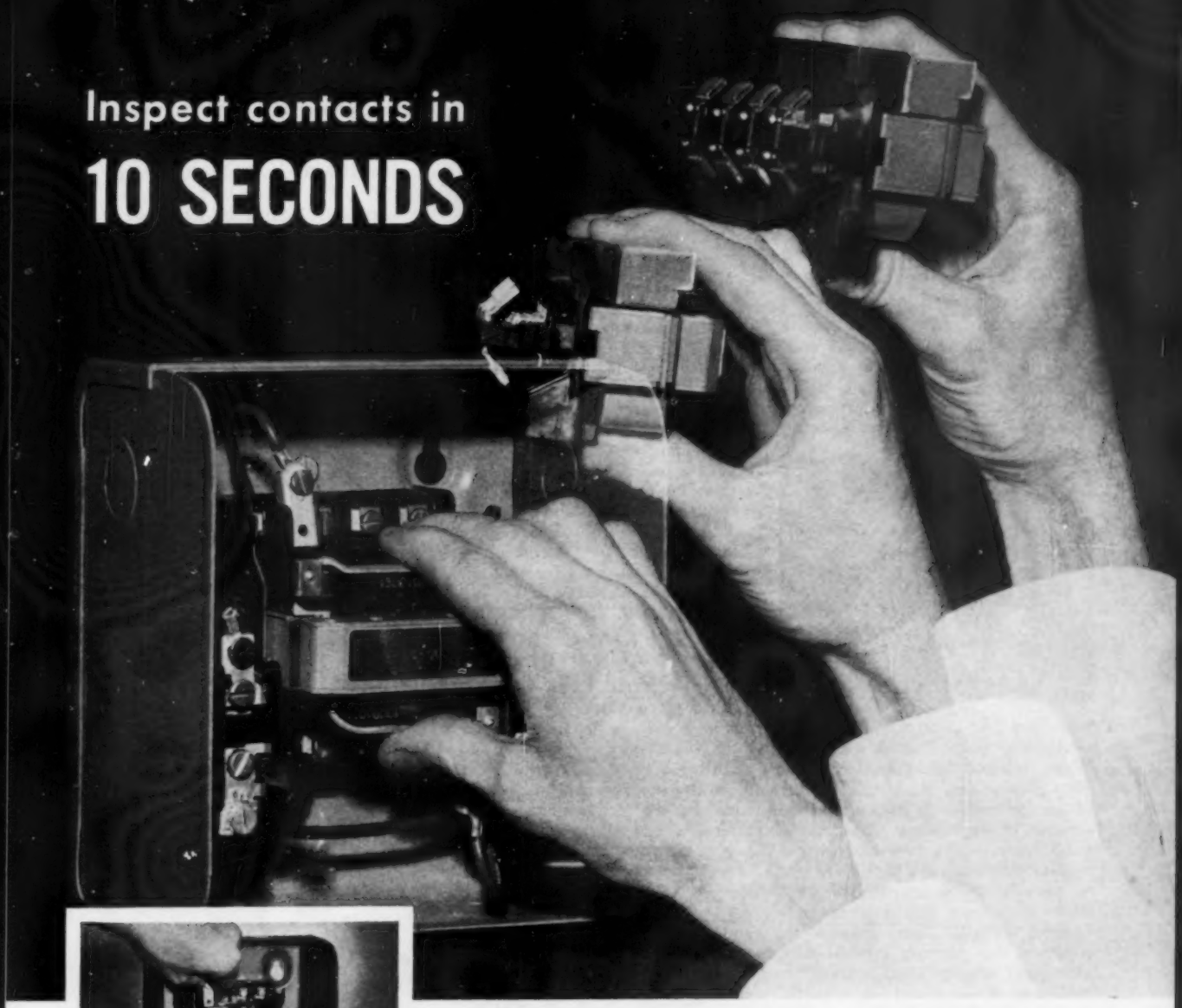
▲ For details, circle 8 on Post Card

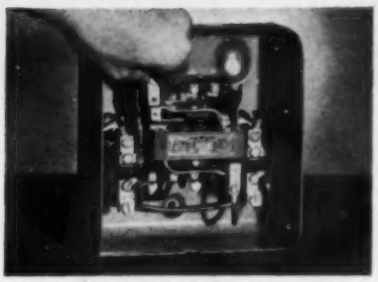


FIRE RESISTANT TILE for stair wells, fire walls, shafts

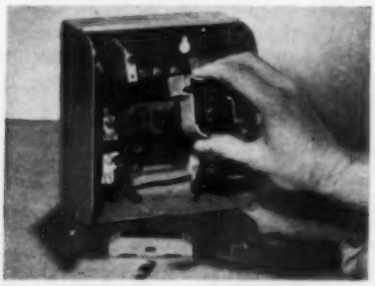
Fireproofer Tile is introduced for use where a single unit nominal 6-in. wall with 2-hr fire resistance rating (unplastered) is required. Units are available in company's 6T series (5-1/16-by 11-3/4 in. face size) with cored shells and three cells in wall thickness. A variety of cermic glazes are available on the select surface, with smooth unselected, unglazed back. Backs with scored surfaces for plaster application may be ordered. The tile is also avail-

Inspect contacts in 10 SECONDS





Lift spring-clamp on coil. The entire magnet and movable contact assembly can now be easily removed without disturbing any wiring on the starter.



Coil change can be accomplished by simply removing magnet spring clip and lifting off "I" magnet and coil.

Snap-slide construction of General Electric 100-Line Magnetic Starters cuts inspection time by two-thirds

In your normal plant operation, how much time is spent inspecting magnetic starters—either as part of a planned maintenance program, or in locating the cause of breakdowns?

With General Electric 100-Line Magnetic Starters, you can save up to two-thirds of the time and money normally required for this operation. The tested reliability of G-E 100-Line starters means fewer breakdowns . . . and if parts replacement is required it can be accomplished in measurably less time.

General Electric's exclusive snap-slide construction makes faster inspection and replacement possible. In just 10 seconds you can remove the entire magnet and movable contact assembly. Just lift the spring clamp on the coil and lift out the assembly. There's plenty of working room and no tools are necessary. There are no screws to take out and no wires to remove.

Ask your General Electric distributor for new bulletin GEA-7020, or write General Electric Company, Schenectady, New York. 813-25

you get **MEASURABLE ADVANTAGES**
WITH GENERAL ELECTRIC CONTROL

Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 206)

able in a buff, unglazed material, in full or light color ranges. Natco Corp.

▲ For details, circle 10 on Post Card

SPRAY COATING PUMPS give wide area coverage

For production line and other coating applications, these airless spray units supply coating materials to guns at hydraulic pressure estimated at 20 times air supply pressure. This, according to company, virtually elimi-

nates fog and overspray, permitting worthwhile paint savings and minimizing need for exhaust equipment, drop cloths and masking. Another advantage claimed is reduction in the number of applications required. In many cases one coat of material applied by the airless method is said to provide a heavier mil thickness than two coats of conventionally applied material. These pumps are suggested for painting fabrics, steel, wood, masonry and other construction materials. One model is reported to cover 10,000 sq ft of flat surface in 11 min. Aro Equipment Corp.

▲ For details, circle 11 on Post Card

SAFETY MARKER warns of wet, slippery floors

Caution Stands are highly visible, two-sided signs of Masonite riveted to galvanized steel frames and fitted with rubber feet. They are suggested for any location where pedestrian safety is threatened by wet or slippery floors, or where foot traffic interferes with cleaning operations. Vivid colors on both sides of the stand are claimed visible even 40 ft away. The self-folding stands are assembled and packaged in sets of five with metal wall bracket. Walton-March.

▲ For details, circle 12 on Post Card

FILMING AMINE INHIBITOR comes in flake form

Super-Filmeen Flake is a filming amine corrosion inhibitor in flake form, described as completely active and containing no additives. The flake is easily weighed and dispersed in water for the feed soution, manufacturer says, and not subject to dehydration at high temperatures encountered in super-heated steam. It is alkaline in the feed solution, relatively non-corrosive to chemical feed systems, and can be mixed in mild steel equipment. Product consists of a drum-dried blend of octadecylamine and a filming amine emulsifier. It has a melting point of 115 to 120 F. Dearborn Chemical Co.

▲ For details, circle 13 on Post Card

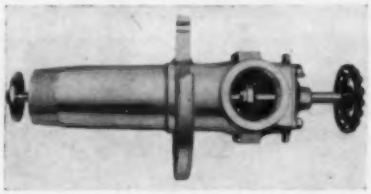
CONTROL EQUIPMENT regulates refrigerant condensing

For uniformly controlling refrigerant condensing temperature and pressures under dry bulb conditions, this system consists of a basic air cooled condensing unit (company's DriCooler), a pressure controlled damper system for low dry bulb operation, and a precooling unit (ADB PreCooler) that lowers high dry bulb entering temperature. Dual spray units in the precooler adiabatically reduce dry bulb temperature of air entering the DriCooler to give it greater heat transfer capability without water reaching the coils. Automatic controls actuate the precooler when the ambient dry bulb temperature reaches a predetermined level. Utilization of this precooler is said to make air cooled condensing practical in areas with high peak temperatures by permitting selection of condenser based on lower design dry bulb temperature. Bulletin DRC-60 gives further data. The Marley Co.

▲ For details, circle 15 on Post Card

DOUBLE SEAT VALVES for bottom of storage tanks

These valves, designed to permit drawing water from the bottom of storage tanks, have two seats or valves mounted on the same stem. The inner valve (shown at left of the photo) seats first. This permits chamber between inner and outer valve to



drain before the outer one is closed. Manufacturer points out that since the inner valve is well inside the tank, insulated by the air chamber between it and the outer valve, and surrounded by tank products, the valves are non-freezing under normal conditions. This is claimed to be the only valve that lets the operator push on the handle with the inner valve closed, and the outer one open, to flush any foreign particles that might cause leakage off the seat of the inner valve.

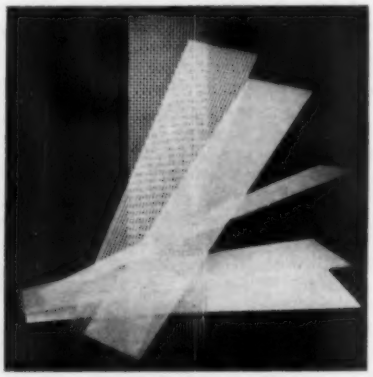
The cap on the end of the valve body, and the outer valve can be removed, and the seat on the outer valve replaced while the inner valve remains closed, it is stated, to permit servicing without emptying the tank. The Johnston & Jennings Co.

▲ For details, circle 16 on Post Card

(More Products on page 215)

LOUVER DIFFUSER—you see it, then you don't

Mystic Gratelite refreshes and mystifies the eye with high intensity, softly diffused lighting. A strong, one-piece louver-diffuser with spear-like tips on longitudinal vanes, it features 3/8-in. open cubicle construction that lets most dust and dirt fall through. When installed in fixtures or overall ceilings, Mystic Gratelite conjures a mysterious lighting phenomenon. It changes from an open louver diffuser to a "solid appearing" luminous panel—depending on your point of view. Two nominal panel sizes—11-by-48 and 16-by-48 in.—are available. Mystic Gratelite is molded of ultraviolet resistant polystyrene plastic and said to afford almost complete



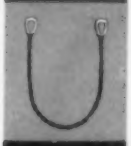
lamp hiding power and optimum light diffusion. It is cleaned in a detergent dip. Edwin F. Guth Co.

▲ For details, circle 14 on Post Card

All-Americans for a Winning Materials Handling Team

These three championship performers give you a materials handling team that is unbeatable... All-American from the basic steel—through the drawing of the wire—to the finished wire rope product.

All-American No. 1 — Whyte Strand Wire Rope. Inspires other members of your team, brings out the best in them for maximum production at lowest cost. (Write for bulletin 6025.)



All-American No. 2 — The Atlas Sling for the safety spot — lifting and carrying all kinds of loads. Flexible, braided construction provides constant championship performance with unquestioned safety. (Write for bulletin 5308.)

All-American No. 3 — Macwhyte Safe-Lock Cable Assemblies are a triple-threat specializing in uniformity, appearance, and agility... for manufactured products and equipment components requiring the positive performance of a custom-made cable assembly. (Write for bulletin 5601.)

In addition to their outstanding performance on the materials handling and production fields, each one of these All-Americans lives up to these championship qualifications: *Dependability* that is the result of constant uniformity, maintained by rigid quality controls at every step of manufacture. *Experience* that pays off in high production scores... and game-winning play with other members of your equipment team specializing in American rules of the game. *Availability* guarantees the right player for every play, whether at the factory or the warehouse... backed up by expert engineering service. *These All-American products are completely made in the U. S. A.*

Start now to build up your All-American materials handling team. Your Macwhyte representative will be glad to coach your selections.

MACWHYTE Wire Rope COMPANY

USED TO THINK EVERY STEAM TRAP LEAKED STEAM.
THEN I FOUND ONE THAT DIDN'T, BUT IT WOULDN'T VENT AIR.
FOUND ONE THAT VENTED AIR, BUT IT NEEDED A COOLING LEG.
DISCOVERED A TRAP THAT REMOVED CONDENSATE AT STEAM TEMP, -MAINTENANCE WAS TOO HIGH.
THEN I FOUND A LOW MAINTENANCE TRAP. IT DIDN'T WORK AGAINST BACK PRESSURE.
AT LAST I FOUND ONE THAT WORKED AGAINST BACK PRESSURE, BUT IT'S CAPACITY RATING WASN'T DEPENDABLE.
ARMSTRONG PROMISES TRUE CAPACITIES AND EVERYTHING ELSE, SO I CALLED THEM. THEY TOLD ME TO RELAX. I COULDN'T.
THEY TOLD ME ABOUT ARMSTRONG'S GUARANTEE. WHAT'D I HAVE TO LOSE. I TRIED THEM.
EFFICENCY IS UP, FUEL BILLS ARE DOWN, SO ARE MAINTENANCE COSTS. MAN I'M LIVING!

No one trap can do *everything* better than every other trap. Some traps vent air better than others, some remove condensate faster, etc. But, there is no one trap *best* in every phase of trapping. Armstrong has been manufacturing the Inverted Bucket Trap for nearly fifty years, and though the traps have changed with the requirements of the times, the Inverted Bucket principle has remained. For on overall trap performance, year-in and year-out, nothing beats the Armstrong Inverted Bucket Trap. It's a rugged well-built trap that does *more* things better than any other trap. It's guaranteed because it's been proved.

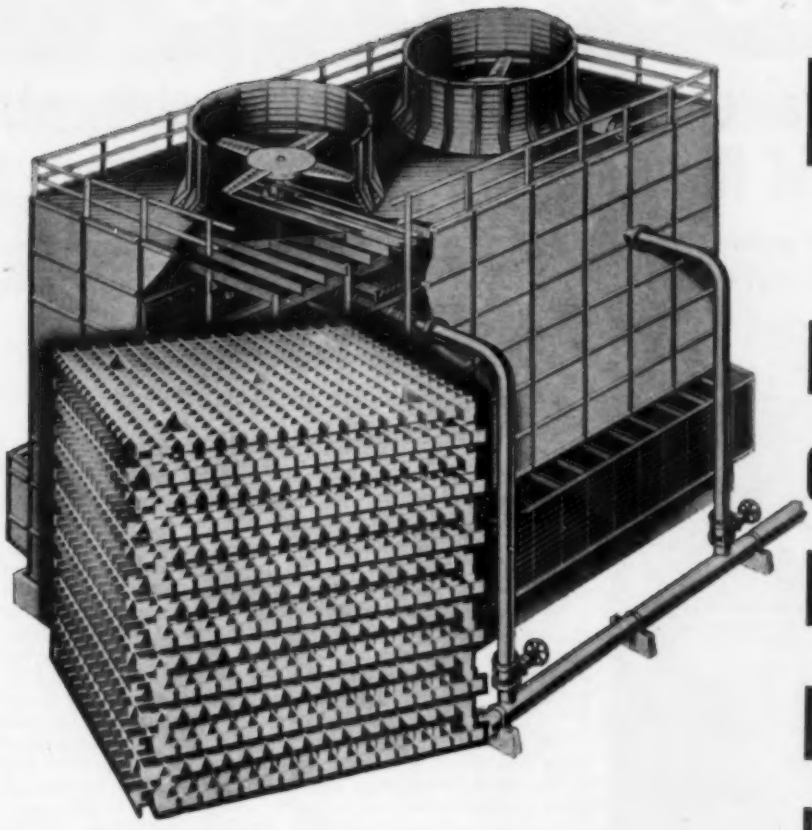
For more details, see your Armstrong Representative and start living . . .

P. S. Like some good meaty reading? Ask for the 48-page Armstrong Steam Trap Book.

ARMSTRONG MACHINE WORKS
9121 MAPLE STREET
THREE RIVERS, MICHIGAN

011-ST

For more facts circle 607 on Reply Card



FLUOR Poly-Grid

highest cooling tower performance

lowest maintenance cost

built-in permanence

etc. *

* Fluor high impact polystyrene and linear polyethylene Poly-Grids provide more cooling per cubic foot, less maintenance, and longer service life than any other cooling tower fill now in use.

Let us put a test grid in your cooling tower. See for yourself. Write:

Fluor PRODUCTS COMPANY **COOLING TOWERS**

A division of The FLUOR CORPORATION, Ltd.

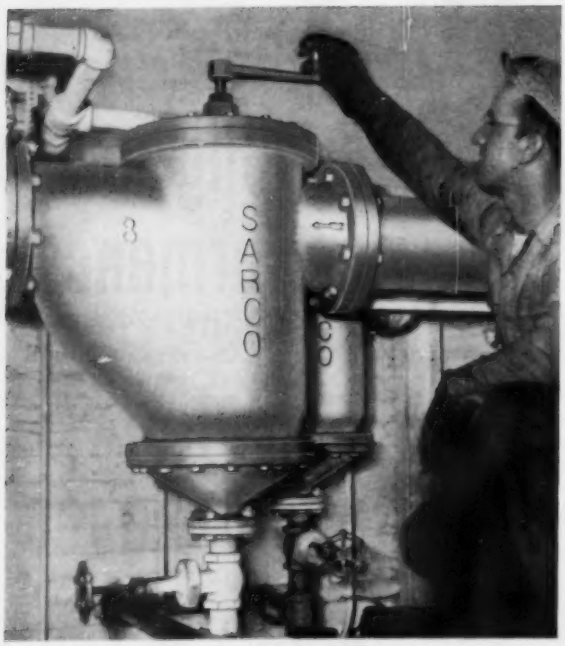
GENERAL OFFICES:
P. O. Box 1267-A
SANTA ROSA, CALIFORNIA

For more facts circle 608 on Reply Card

SARCO TOPICS

How correct strainer selection protects equipment, maintains fluid flow, and prevents shut-downs

Strainers for wash water for power plant condensers cleaned without shut down



Sarco Type VRS Rotary Scraper Strainers enable operators to clear the screens with a few turns of the crank, without shutting down the line or dismantling the strainer.

Sizable quantities of water are required for cleaning condenser water screens at a power plant in California. Sea water is pumped for the purpose and must be freed from debris and sea life such as mussels and sardines. Further, any screening devices used must be capable of cleaning without shut-down.

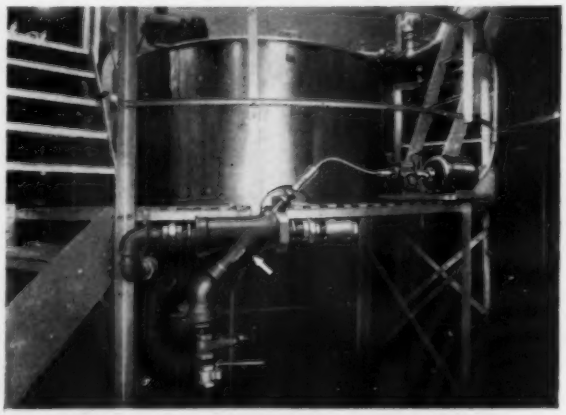
These problems were met by installing two Sarco type VRS scraper strainers ahead of the wash water pumps. This type of strainer is cleaned by rotating a spiral blade either manually or by motor drive. Motor-operated rotary-type strainers make it possible to clean the strainer continuously. The blade scrapes the screen clear, and collected solids are blown down from the strainer as required. Clean screens minimize pressure drop. The Sarco strainer installation has materially reduced maintenance hours and insured against temporary shut-down caused by clogged strainers.

Helical scraper knife clears screen without shutdown in East Chicago Air Conditioning System

Offices of the Inland Steel Company, at East Chicago, Indiana, are cooled with air conditioning units of 7½ tons and larger. Water for condenser cooling is pumped in from Lake Michigan.

Although passing through traveling screens, the incoming water still contained fine sand which clogged the screens. Frequent cleaning was required, and every now and again the units were practically out of service.

Plant engineers found their answer in Sarco Rotary Scraper Strainers, Type VRS. These units incorporate a hand-operated helical scraper knife within the cylindrical strainer screen. These scrapers made it possible to keep the strainers clean simply by cranking the scraper a few turns at regular intervals. Sand scraped off the screen is blown clear and discharged at pressure through a manually operated valve to waste. Now it is not necessary either to dismantle the strainer or shut down the unit.



IN PROCESS APPLICATION This Sarco motor operated-Scraper Strainer, Type SRS, is used to strain chocolate syrup in a processing application, providing continuous flow of fluid without shut-down for maintenance. 2167

For information on Sarco strainers, contact your Sarco sales representative, district office, or distributor; or write—

SARCO

SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

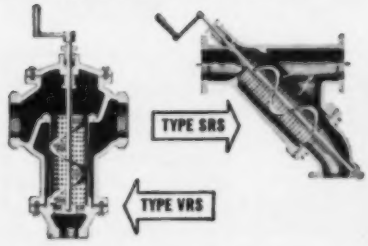
STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

For more facts circle 609 on Reply Card

SARCO

PIPELINE STRAINERS
help prevent shutdowns
HANDLE ALL MEDIA
condensate, steam, water, oil, and other piped fluids
PROTECT ALL EQUIPMENT
temperature and pressure regulators, steam traps, pumps, meters, burners, compressors, hydraulics, lubricators, and nozzles.
AVAILABLE IN ALL TYPES AND SIZES

SCRAPER STRAINERS
hand operated and motorized



SELF-CLEANING Y-TYPE
NEW! TYPE CT CAST STEEL, SPECIFICATION A.S.T.M. — A-216 Gr. WCB

SARCO
Tensile strength 70,000 lbs. per square inch minimum, for saturated steam or liquids to 600 psi, non-shock and 750° F. total temperature.

Also Sarco Y-Type strainers in cast iron, brass, and semi-steel, screwed and flanged, all sizes and pressures.

For information on Sarco strainers, contact your Sarco sales representative, district office, or distributor; or write— 2166

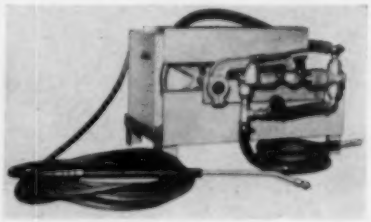
SARCO
SARCO COMPANY, INC.
635 MADISON AVENUE, NEW YORK 22, N. Y.
PLANT: BETHLEHEM, PA.

NEW PRODUCTS

(Begins on page 206)

WASHER cleans parts, machinery and equipment

Multi-Job Washer is both powered and heated by electricity. Its positive displacement pump draws cleaning solution from a drum or tank and the solution is delivered at temperatures to 180 F. By changing the gun nozzle

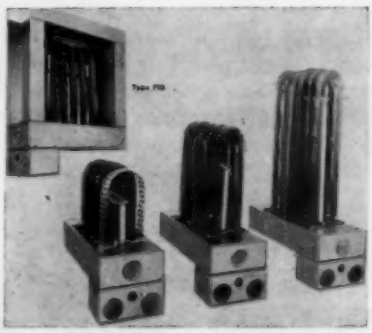


orifice and a single control, pressure of the hot cleaning solution may be increased from 250 to 300 lb, as required by the cleaning job. Manufacturer emphasizes that the Multi-Job Washer is a many-purpose machine combining heat, high pressure, a new detergent claimed harmless to finished surfaces, or to metals or wiring, when used as directed. The unit fits the top of a 55-gal drum, operates on 220 v, 60-cycle, single-phase, a-c. It comes with 40 ft of solution hose, gun and two nozzles and weighs about 106 lb. Homestead Valve Mfg. Co.

▲ For details, circle 17 on Post Card

AIRDUCT HEATERS for new, existing ductwork

Chromalox Electric Airduct Heaters —Type FFT, for existing ductwork, and Type FTD, for new ductwork— have a Chromalox Fintube metal-sheath element with a ceramic coating to prevent corrosion, even after long exposure to high-humidity summer air. Both series are UL listed, have



heavy-gage, corrosion-resistant terminal boxes and frame parts spot-welded into a rigid assembly. Standard sizes are stocked and special sizes are available to 28-by-48 in. duct size, in ratings to 10.7 kw per square foot of duct area, with range capacity from two to 100 kw, ratings from 120 to 550 v. Edwin L. Wiegand Co.

▲ For details, circle 18 on Post Card

VARNISH DIP SYSTEM is space-saving two-tank unit

Floor space saving up to 60 per cent as well as good control of work withdrawal and constant level of varnish are reported for this dipping system. For applying varnish insulation to stators, motor windings etc., it makes use of two shorter (only 8 ft long) tanks, one above the other, built into an operating unit (including hydraulic and varnish circulating systems) occupying a floor area only 6 ft wide. As in conventional procedure, the conveyor from the preheat oven runs over the upper or dip tank of the system, but is designed so it can be

stopped to "spot" work (suspended from hangers) over the dip tank.

As the conveyor stops, it triggers a limit switch and the upper tank rises to immerse the work—while the lower tank moves downward. After immersion, the upper tank lowers automatically and the lower one rises. The lower tank serves as a counterweight, keeps varnish in dip tank at proper level, and holds the cooling coils. Tank movement is effected through a hydraulic cylinder, piston and chain drive arrangement. The dip tank allows immersion up to 9 in. While timing is adjustable, work is normally submerged for 7 sec. The R. C. Mahon Co.

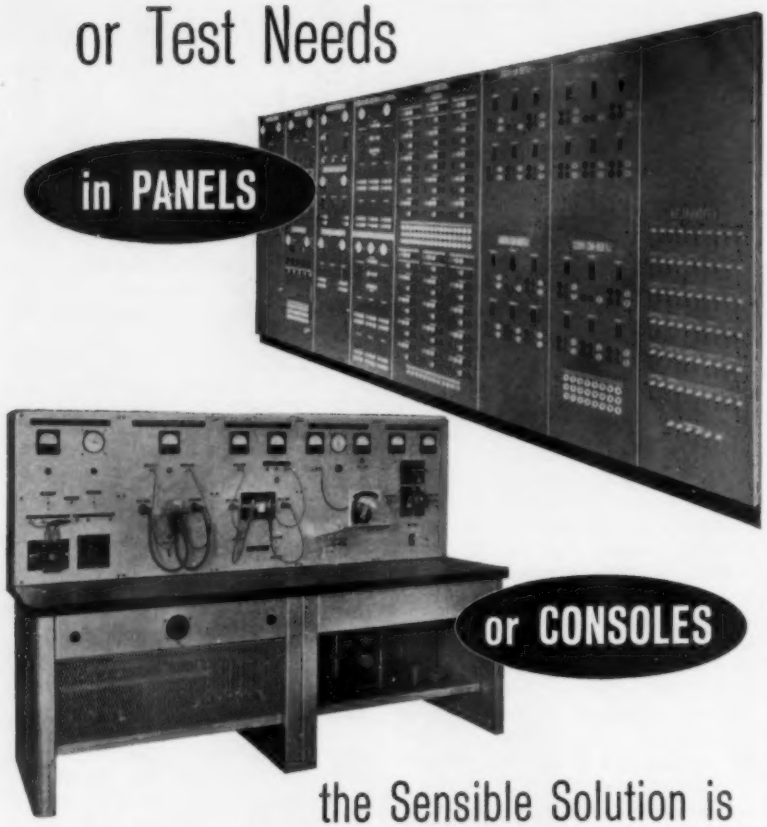
▲ For details, circle 19 on Post Card

MOTOR features built-in overheat protection

The Guardistor Motor is designed to provide positive inherent motor protection by means of positive temperature coefficient (PTC) thermistors. This protection is based on sensitivity of the thermistors to heat build-up in the motor winding alone, rather than being affected by line currents. The motor can be used for any a-c application and protects against overheating due to: single phasing, locked rotor, too frequent starting, repeated

Cost Conscious Companies Confirm that...

for Electrical Distribution or Test Needs



the Sensible Solution is

CUSTOM-DESIGNED *flexlab*®

EQUIPMENT by STANDARD

Realistic plant engineers recognize that, for design and construction of specialized equipment like this, it's good sense to rely on a qualified outside source.

By cooperating with a company like Standard, the harried plant engineer is freed of much troublesome detail... finds more time to turn his talents to his many other responsibilities.

Standard engineers will be glad to consult with you and offer recommendations. And whether the solution is a small power pack or a million dollar, multi-building installation, Standard has the skills, experience and facilities to design and produce—completely—the equipment to meet your requirements.

STANDARD TRADEMARK

Request Catalog No. 247 describing Standard industrial panels and consoles.

THE STANDARD ELECTRIC TIME CO.

89 LOGAN STREET • SPRINGFIELD, MASSACHUSETTS

For more facts circle 610 on Reply Card

NEW PRODUCTS

(Begins on page 206)

overloads, high ambient temperatures, abnormal voltage conditions, ventilation failures, switch welding (on single-phase motors) and plugging or reversing duties.

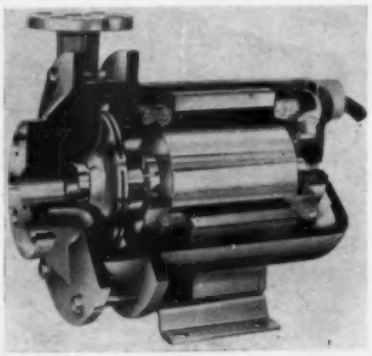
The contactless PTC thermistor—a semiconductor—is an integral part of the motor. Each thermistor is encapsulated in epoxy resin before installation in the motor winding. This encapsulation, plus the motor insulation, provides resistance to moisture, chemicals and oils. The thermistor is not affected by temperature until it reaches its predetermined critical temperature which is designed for the limitation of each insulation class and enclosure. At predetermined temperature, it has a 100 to 1 positive change in resistance versus temperature, giving a snap-action-type response. Westinghouse Electric Corp.

▲ For details, circle 20 on Post Card

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 245-246. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

CANNED PUMPS handle hazardous or costly fluids

This canned pump is designed for leak-proof handling of dangerous or expensive fluids. It is a self-contained motor pump in which the material being handled circulates within the motor. The pump impeller is connected directly to the motor shaft—no seals, packing or stuffing box are



required. The motor rotor and field are encased in welded stainless steel "cans", isolated from material being pumped. The pumped fluid lubricates

color plus protection

Good looks and good maintenance go on together with a coat of the new colored aluminum paints and roof coatings. Industrial buildings and installations can actually be *decorated* for *protection*.

Attractive colored aluminum paints provide heat reflectivity and insulation benefits. In addition, they protect metal and other surfaces from corrosion, rust and weathering. They're easy to apply by brush, roller or spray gun. Ideal for interior or exterior use, for roofing or equipment, for coding pipe or beautifying and protecting buildings.

Although Reynolds does not make paint, it does supply the finest quality aluminum pigment to leading manufacturers of colored aluminum paints and coatings. For names of manufacturers write *Reynolds Metals Company, Box 2346-PL, Richmond 18, Virginia.*

with new colored aluminum paints made with

REYNOLDS ALUMINUM PIGMENT

The Finest Paints Made with Aluminum are made with REYNOLDS ALUMINUM PIGMENT

Watch Reynolds TV Shows: "Bourbon Street Beat" and "Adventures in Paradise"; and, resuming in October, "All Star Golf"—ABC-TV

For more facts circle 611 on Reply Card

THE BRIDGE TO *Progress* AND *Safety...*

The bridge in this picture, designed to carry both horse power and man power across the Root River, represents a step to further expansion of Western Printing and Lithographing Company facilities in Racine, Wis.

Western selected Globe's Safety GRIP-STRUT grating on this bridge for greater safety and for greater economy. Safety GRIP-STRUT is the new basic material, all in one piece (including channels), not welded, riveted or expanded, in steel or aluminum, in standard sizes and gauges. It presents an open space, in a diamond pattern, in excess of 55% of the area for a positive NON-SKID footing in all directions. It is also ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

IMPORTANT SAFETY FEATURES:

Fire proof, slip proof, maximum strength, minimum weight, easy to stand and walk on, cool in summer, warm in winter.

BIG ECONOMY FEATURES:

For balconies—no extra light needed below—no extra heat. No extra supports needed—Channels are integral part of the material. No secondary sprinkler heads necessary. Self cleaning. Cut and installed like lumber by your own maintenance force. Low in original cost.

Write for new complete catalog. Distributors in all principal cities. Consult yellow pages in phone book under "GRATING".

GRIP-STRUT PATENTED

PRODUCTS DIVISION

THE GLOBE COMPANY

4016 S. PRINCETON AVENUE
CHICAGO 9, ILLINOIS 117

For more facts circle 612 on Reply Card

NEW PRODUCTS

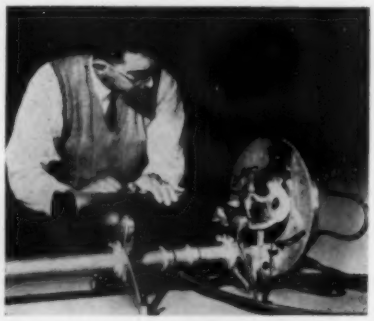
(Begins on page 206)

the unit. All wettable parts of the pump, except the Graphitar bearing, are made of 316 stainless steel. The pump is designed for all-angle installation, suited for use in close quarters, and available in ½, 3/4 and 1 hp ratings, to 63 gpm. The Moyno Pump Div., Robbins & Myers, Inc.

▲ For details, circle 21 on Post Card

BEADING KIT for "do-it-yourself" glass piping, drains

With this kit you can fabricate glass process piping and drainlines at the job site. You can make the non-standard lengths required and avoid ordering custom made sections. The



kit—for rental or purchase—provides equipment needed to score and cut Pyrex brand piping to specified lengths and to bead section ends for making permanent compression joints. A single cutting device and one burner can be used on all sizes of the piping—from 1-to 6-in. diam. Heat source used is a combination of oxygen and "bottled" or natural gas. The equipment comes in a steel carrying case, includes an instruction manual. Corning Glass Works.

▲ For details, circle 22 on Post Card

ROOF COATING is offered in eight colors

Siliconed Asbestolite, an aluminum-asbestos roof coating, is available in metallic colors: white, green, blue, red, gray brown and aluminum. It won't fade, bleed or discolor, says manufacturer. Other advantages claimed are: greater roof coverage, long-lasting protection against water and heat, and low maintenance. It can be applied on asphalt and asbestos shingles, composition roofs (pitched or flat), concrete block, metal, stucco walls, and asbestos cement siding. As the coating sets, aluminum flakes rise to the surface and "leaf" to form a reflective insulating "shield", permanently bonded to the roof surface. It

HOW MUCH DOES IT **REALLY** COST YOU TO REPLACE A BURNED OUT LAMP?

The cost of the lamp, of course. Plus the cost of the maintenance man's labor and the valuable minutes your work flow is disrupted.

For example: A man replaces a burnout on a one-at-a-time basis in about 20 minutes. If he makes $1.50 an hour, his labor is 50¢. If he interrupts somebody else's work for just five minutes, and your company estimates machine time at $10.00 an hour (it's probably more), there goes another 83¢. This is probably more than you paid for the lamp itself!

G-E Plan For Group Relamping Can Save 26 Hours Labor For Every 100 Lamps! It's based on the more uniform life cycle of General Electric Lamps—and is a time-saving, work-saving, lamp-saving, no-bookkeeping program that can be adopted by any company *even if you've just installed another brand of lamps!* If you're in the dark about this outstanding plan, don't delay another costly day. Send for the whole exciting story by mailing the coupon today!

Progress Is Our Most Important Product

GENERAL ELECTRIC

MAIL THIS COUPON TODAY!

General Electric Co., Large Lamp Dept. C-823
Nela Park, Cleveland 12, Ohio
I want to cut my lighting maintenance costs to the bone! Send me more information on General Electric's Group Relamping Plan right away!

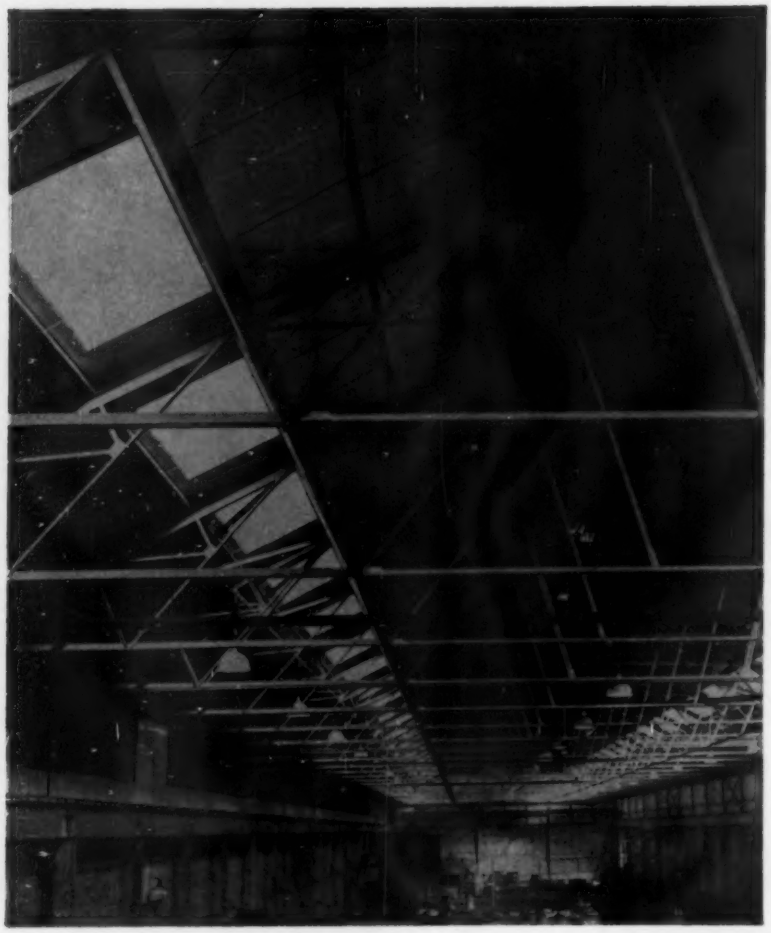
NAME_____

COMPANY_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

For more facts circle 613 on Reply Card



60,000 square feet of Hetron® gives Harvey Aluminum 25% more light plus a bonus in fire retardance

Cool natural daylight cascades down on the service areas of Harvey Aluminum's reduction plant at The Dalles, Oregon.

It comes through translucent fiberglass-reinforced polyester (Hetron) panels installed in continuous bands in the roof and walls.

Says Herbert Harvey, president of the primary aluminum producer:

"We needed a building material that would provide a maximum of natural daylight and would nest perfectly with our corrugated aluminum siding and roofing for a weather-tight seal. After conducting endurance tests, we specified the panels made by Filon Plastics Corporation. They're weatherproof and shatterproof. They provide diffused, glarefree daylight for all working areas."

Fire retardance, too. Hetron won't support combustion. These stronger, safer panels carry both Underwriters' and Factory Mutual seals of approval. You can specify them with confidence. Just write "Hetron-based" on the spec sheet.

If you'd like names and addresses of fabricators who can supply them, drop us a line.

DUREZ PLASTICS DIVISION
3907 WALCK ROAD, NORTH TONAWANDA, N. Y.
HOOKER CHEMICAL CORPORATION

HOOKER CHEMICALS PLASTICS

For more facts circle 614 on Reply Card

NEW PRODUCTS

(Begins on page 206)

comes ready to use, requires no heating, thinning or mixing, and can be applied with roof brush, spray gun or squeegee. The Monroe Co., Inc.

▲ For details, circle 23 on Post Card

LONG LIFE BATTERY for light duty equipment

Exide 3-KCS-9 is reported to deliver 9 to 30 per cent more electrical energy than automotive-type batteries, yet is sized physically to substitute for them. For light-duty industrial trucks, personnel carriers, sweepers, and other small electrically powered

units, it is designed for long power-drain service demanded by them. It has a predicted minimum service life of 4 yr—several times the usual life of automotive batteries in this type of service. A 6-v, three-cell unit, the Exide 3-KCS-9 even has higher amp-hr rating per plate for its size than its predecessors in the heavy-duty industrial field, because the space within the battery container is used more efficiently, manufacturer points out. The new battery has an electrical capacity of 180 amp-hr at the 20-hr discharge rate; capacity at 6-hr rate, 143 amp-hr. Exide Industrial Div., The Electric Storage Battery Co.

▲ For details, circle 24 on Post Card

DUST CONTROL SYSTEM designed for small plants

The Type G Chem-Jet Proportioner is announced as a simpler and more compact dust control unit, offering worthwhile saving for limited capacity plants. It is reported of particular significance to industrial power plants receiving 150 tons of coal per day or with coal handling capacities not exceeding 100 tph and small crushing plants where handling capacities do not exceed 150 tph. Dust is controlled by applying a small amount of moisture at points in the operation where dust is created. To produce the wet-

20,000 RPM HAND GRINDER is excellent for tool and die work, pattern and model work. Also available in 36,000 rpm ultra high speed model. ¼" collet chuck. Weighs only 2¼ pounds.

6" HEAVY DUTY PORTABLE GRINDER tackles the toughest work encountered in grinding heavy castings, wire brushing or buffing and polishing most metal surfaces. Contour-grip handle.

9" SUPER-DUTY PORTABLE SANDER-GRINDER offers light weight, high speed and tremendous power, even under maximum load. Used with 6" cup grinding wheels, 6" wire cup brushes, 7" and 9" disc wheels and 7" and 9" sanding discs.

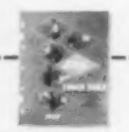
⅓ HP 6" BENCH GRINDER has powerful split-phase motor, all ball-bearing construction. Features include eye shields, end-bell covers and adjustable tool rests. For all kinds of grinding, sharpening and wire brushing work.

There isn't a tough grinding job going that a SKIL GRINDER can't handle!

Rugged SKIL Grinders, both portable and bench type, are ready to handle *any* grinding job—the tougher the better! The only question is which one suits your particular grinding needs best. There are 18 powerful models in all plus a full line of accessories, including grinding wheels, wire brushes and eye shields. Ask your SKIL dealer for a Grinder demonstration and a copy of the 58-page SKIL Industrial Power Tool Catalog. Or simply mail coupon.

SKIL

Made only by SKIL Corporation.
Chicago 30, Illinois, Factory Branches in leading cities.



FREE! 58-page Industrial Tool Catalog

SKIL Corporation, Dept. 129G
5033 Elston Avenue
Chicago 30, Illinois

In Canada:
5601 Dundas Street, West
Toronto 9, Ontario

☐ Please send me name of nearest distributor.

☐ Please send me FREE booklet on SKIL power tools.

Name_____

Address_____

City_____ Zone_____ State_____

For more facts circle 615 on Reply Card

Now Available!

CHEMTROL
"ALPHA SERIES"
PLASTIC PUMPS
IN PENTON*

for handling
HOT CONCENTRATED ACIDS, ALKALIES, SALTS and MANY SOLVENTS!

Newest plastic pump design! Molded from Penton* for widest possible corrosion resistant service even at elevated temperatures. Safely handles corrosive chemicals such as concentrated sulphuric acid, concentrated chlorine solutions, ferro-cyanide bleach and concentrated sodium hydroxide. Features high operating efficiencies, excellent balance, low maintenance.

Positive mechanical seal maintains exceptional corrosion resistance and eliminates all metal subject to corrosive attack. Seal consists of Teflon ring rotating against ceramic faces of near-diamond hardness ground to tolerances measured in light waves.

For long, trouble-free pump life check Chemtrol. Ask for operating data, chemical resistances, prices. For recommendations send operating requirements.

SPECIFICATIONS: Chemtrol "Alpha Series" Pumps

Availability: Close coupled, immediately; pedestal mount to follow.
Size: 1" outlet x 1¼" IPS inlet.
Materials: Body, impeller and seal housing in Penton.*
Shaft Seals: Mechanical with Teflon seal rotating against stationary ceramic sleeve.
Motors: ⅛ to 2 h.p.; 1750 to 3500 r.p.m. Drip proof, fully enclosed or explosion proof.
Impellers: Enclosed type with optimum contour design. Open type for special service.

*Hercules Powder Co.

chemtrol®

CHEMTROL
404 West Central Avenue • Santa Ana, California

For more facts circle 616 on Reply Card

NEW PRODUCTS

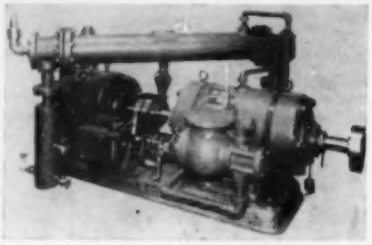
(Begins on page 206)

ting action, a surface active compound is used. This concentrated solution is mixed by the system with water in a ratio of one part solution (company's Compound MR-200) to 200 parts of water. The low cost system includes a proportioning pump to deliver a fixed quantity of the compound from a solution drum, spray jets with housing and strainer assemblies, a 3/4-in. solenoid valve, strainer and plug valve, and push button control. The unit must be supplied with clean water at 60 psi pressure at the points of application. The Johnson-March Corp.

▲ For details, circle 25 on Post Card

TWO-STAGE COMPRESSORS are compact, pre-assembled

Designed to simplify installation and foundation problems these rotary compressors come preassembled—addition of motor, air and water piping is all that's required at the site. They feature an overhead intercooler for compactness, and can be placed for operation on a floor or mezzanine. The line includes two-stage models covering capacities from 279 to 3300 cfm and discharge pressures to 125 psi. Direct connection can be made to



electric motors, gas motors, or gear-turbine drive. Each stage comprises a cylinder with heads, thoroughly water-jacketed. Intake and discharge openings are in a horizontal plane on opposite sides of the cylinder, to avoid reversal of air flow and further simplify piping. Fuller Co.

▲ For details, circle 26 on Post Card

OVERARM SHEET FEEDER feeds from pile to equipment

This large-size overarm feeder for feeding sheets from pile to processing or conveying equipment, or conversely, handles a variety of materials—plastics, cardboard, metal, asbestos board, etc.—in sheets ranging in size to 6 by 20 ft. The feeder grasps sheets by means of vacuum cups supported on a carrier mounted between two oscillating arms; rotates the arms from

For more facts circle 617 on Reply Card →

Air operates this folding machine to provide the neatly folded, factory-fresh shirts found in popular shirt stores. In the background, left, is an air- and steam-operated pressing machine that furnishes smoothly pressed shirts in seconds.

Compact 25S2 distributes air through 2-inch air-mains and laterals to individual machines. Mr. Hopper, (at right), expects "many years of trouble-free service from the Model 25S2 compressor."

Van Heusen "cuts operator fatigue—ups output per machine by 10% to 20%" with a

LE ROI 25-HP STATIONARY COMPRESSOR

Shirt-making is exacting work. It's so tiring that an operator's output can drop 40% in five hours. To reduce fatigue and to maintain efficiency, "we prefer air control for the more delicate operations of sewing and trimming machines, laundry, pressing and creasing work," reports Charles G. Hopper, assistant to the production manager of the Pottsville (Pa.) plant of Phillips-Van Heusen Corp.

At least some of the credit for reducing fatigue and increasing production is given to the 25 horsepower Le Roi compressor which provides air-power in their shirt factory.

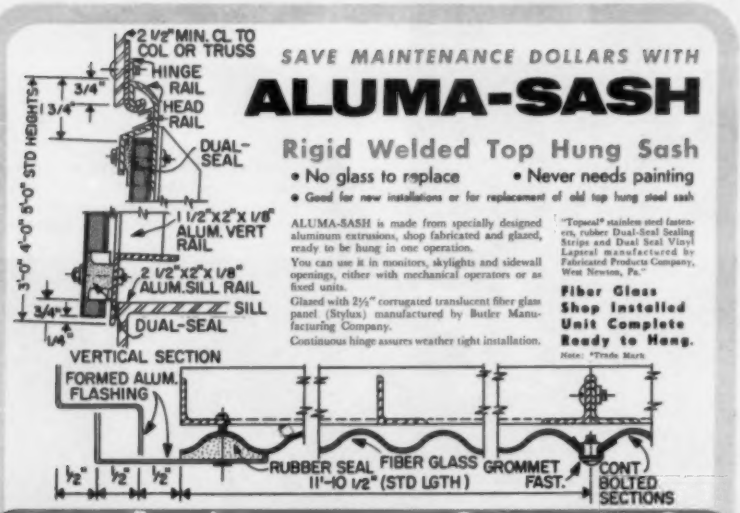
The 105 cfm, 125 psi capacity of the Le Roi 25S2 air-cooled compressor more than meets current needs, and provides for the addition of more air-operated machines. Mr. Hopper states that the unit operates 10 hours a day, five and one-half days a week. To assure dependable air supply, valves of the 25S2 are inspected weekly, and oil is changed every 200 hours.

Why don't you check the benefits of pneumatic operation? Le Roi can meet your needs with Westinghouse unit-type and Le Roi stationary air compressors from ½ to 100 hp. See your Le Roi distributor for more information. Or write to Le Roi Division, Westinghouse Air Brake Co., Milwaukee 1, Wisconsin.

LE ROI STATIONARY COMPRESSORS

86-09

PORTABLE AND TRACTAIR® AIR COMPRESSORS • STATIONARY AIR COMPRESSORS • AIR TOOLS



SAVE MAINTENANCE DOLLARS WITH

ALUMA-SASH

Rigid Welded Top Hung Sash

- No glass to replace
- Never needs painting
- Good for new installations or for replacement of old top hung steel sash

ALUMA-SASH is made from specially designed aluminum extrusions, shop fabricated and glazed, ready to be hung in one operation.

You can use it in monitors, skylights and sidewall openings, either with mechanical operators or as fixed units.

Glazed with 2½" corrugated translucent fiber glass panel (Stylux) manufactured by Butler Manufacturing Company.

Continuous hinge assures weather tight installation.

"Topeal" stainless steel fasteners, rubber Dual-Seal Sealing Strips and Dual Seal Vinyl Lapseal manufactured by Fabricated Products Company, West Newton, Pa."

Fiber Glass Shop Installed Unit Complete Ready to Hang.

Note: "Trade Mark

H. A. Harry Glass Co.

1644 N. MILWAUKEE AVE. • CHICAGO, ILLINOIS

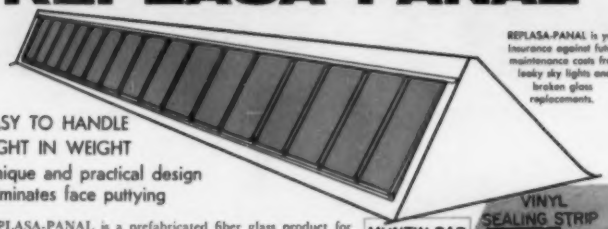
• ALUMA-SASH • REPLASA PANAL
• CORRUGATED GLASS • FIBERGLASS

THIS YOUR PROBLEM?

NEXT TIME

Reglaze for the last time with

REPLASA-PANAL



REPLASA-PANAL is your insurance against future maintenance costs from leaky sky lights and broken glass replacements.

EASY TO HANDLE
LIGHT IN WEIGHT
Unique and practical design eliminates face puttying

REPLASA-PANAL is a prefabricated fiber glass product for replacement of shattered and fractured panes in top hinged, continuous, operated or fixed steel sash. Panels are made to fit the present opening for any make of sash. No cutting, fitting nor mechanical knowledge is necessary.

SALES REPRESENTATIVES

MR. HAROLD P. ACKERMAN
320 McClatchy Bldg., Upper Darby, Pa.
AMERICAN BUILDERS SUPPLY CO.
1044 East Chestnut St., Louisville 4, Kentucky
BUIE BUILDING MATERIAL CO., INC.
7400 Washington Avenue, Houston 19, Texas
BUILDING SPECIALTIES CO.
Century Building, Pittsburgh 22, Pa.
FRED M. COLE CORP.
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DESCO
9874 St. Charles Rd., St. Ann, Missouri
R. J. FITZGERALD CO.
19151 Schoolcraft, Detroit 23, Mich.
HUME SALES, INC.
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EARL E. KREISSLER
406 West 34th St., Kansas City 11, Missouri
R. S. MARTIN COMPANY
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SHEARER & RAYFORD, INC.
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LEWIS C. TROWBRIDGE, INC.
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ALUMA-GLASS BUILDING PRODUCTS, INC.
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BRANCH-NICOLOFF CO.
549 Washington St., Chicago 6, Illinois
BUILDING SPECIALTIES
2907 Haywood Avenue, Chattanooga 5, Tenn.
W. PAUL CADDELL
1709 - 4th Ave., Birmingham, Alabama
CONSTRUCTION SERVICES CO.
P.O. Box 3333, Knoxville 17, Tenn.
HOLMQUIST CO.
1710 - 3rd Avenue, Moline, Illinois
WAGHORNE-BROWN CO.
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BEN OWEN COMPANY
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GEO. A. RUEPPEL
64 Tibbets Road, Yonkers, N. Y.
A. O. STILWELL CO.
991 Main St., Buffalo, N. Y.
WAUWATOSA FUEL & SUPPLY CO.
7700 W. State St., Wauwatosa 13, Wisconsin
WEIGAND BUILDING PRODUCTS CO.
5716 Griffith Road, N.W., North Canton 20, Ohio
JNO. A. WILLIAMSON COMPANY
801 Avenue A, San Antonio 2, Texas
IDEAL BUILDING MATERIALS INC.
1730 Claiborne Avenue, Shreveport, La.
SHEBOYGAN GLASS CO.
317 Center Avenue, Sheboygan, Wisconsin
R. J. OLSON GLASS CO.
625 William Street, Madison, Wisconsin

PATENTS AND PATENTS PENDING **H. A. HARRY GLASS CO.**

For more facts circle 618 on Reply Card

NEW PRODUCTS

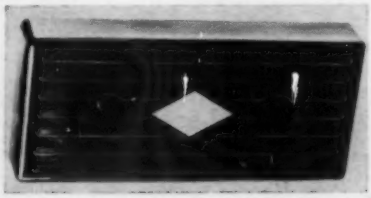
(Begins on page 206)

one side of machine to the other, lowers the carrier to engage a sheet on one side, and transfers carrier-and-load to the other side, releases the vacuum, and deposits the sheet in piles—up to 30 in. high. The carrier automatically returns for another sheet unless machine is set for single cycle operation. It is hydraulically operated, handles rectangular, irregularly shaped, flat or formed sheets (corrugated), and can pick up or deliver sheets vertically and horizontally. Floor space required is slightly larger than sheets. The de Florez Co., Inc.

▲ For details, circle 27 on Post Card

DOCK BUMPERS compounded from live rubber

Flexo Bumperettes (Models C-818, C-818-S) are introduced to protect truck dock, truck and cargo from collision damage. Counterbored holes in the bumpers take any 3/4-in bolt and standard 2-in. washer for easy



mounting on dock structure. Bumperettes are compounded from live rubber for impact resistance, and are claimed impervious to weather, fluid and fumes. Model C-818, standard design, is 18 in. long, 8 in. wide and 2 in. thick. Model C-818-S is 22 in. long, 8 in. wide and 2½ in. thick; and is reinforced with a steel plate to permit installation by welding. Both models come in medium grade black rubber or nylon, high grade black rubber, or non-marking gray with a red diamond molded into the face to aid truck alignment. Bumpers, Inc.

▲ For details, circle 28 on Post Card

DUCT LINER for heating, air conditioning systems

Exceptionally low fire hazard rating and "dual density" construction are announced for Micro Bar, a duct liner available in 1/2-to 2-in. thicknesses. A resilient, semi-rigid insulation blanket of strong, fine glass fibers bonded by a thermosetting resin, Micro Bar is made up of two densities of insulation, each serving an essential function. The black colored surface is heavy density fiber glass for resistance to high air velo-

cities up to 5000 fpm. Its toughness is reported to make it easy to form integral nosings at the leading edges during installation, eliminating need for metal holding strips and nosings.

Under the heavy density material is an amber colored light density portion which provides better sound absorption—claimed twice that of many commercially available liners—and overall thermal performance. Micro-Bar is described as light in weight, easy to use, not harmful to hands and requiring no protective clothing. It comes in four widths from 24 to 48 in. Brochure IN-302 gives details. Johns-Manville.

For details, circle 29 on Post Card

More information on any of these products can be yours without cost or obligation. Use Reader Service Cards provided on pages 245-246.

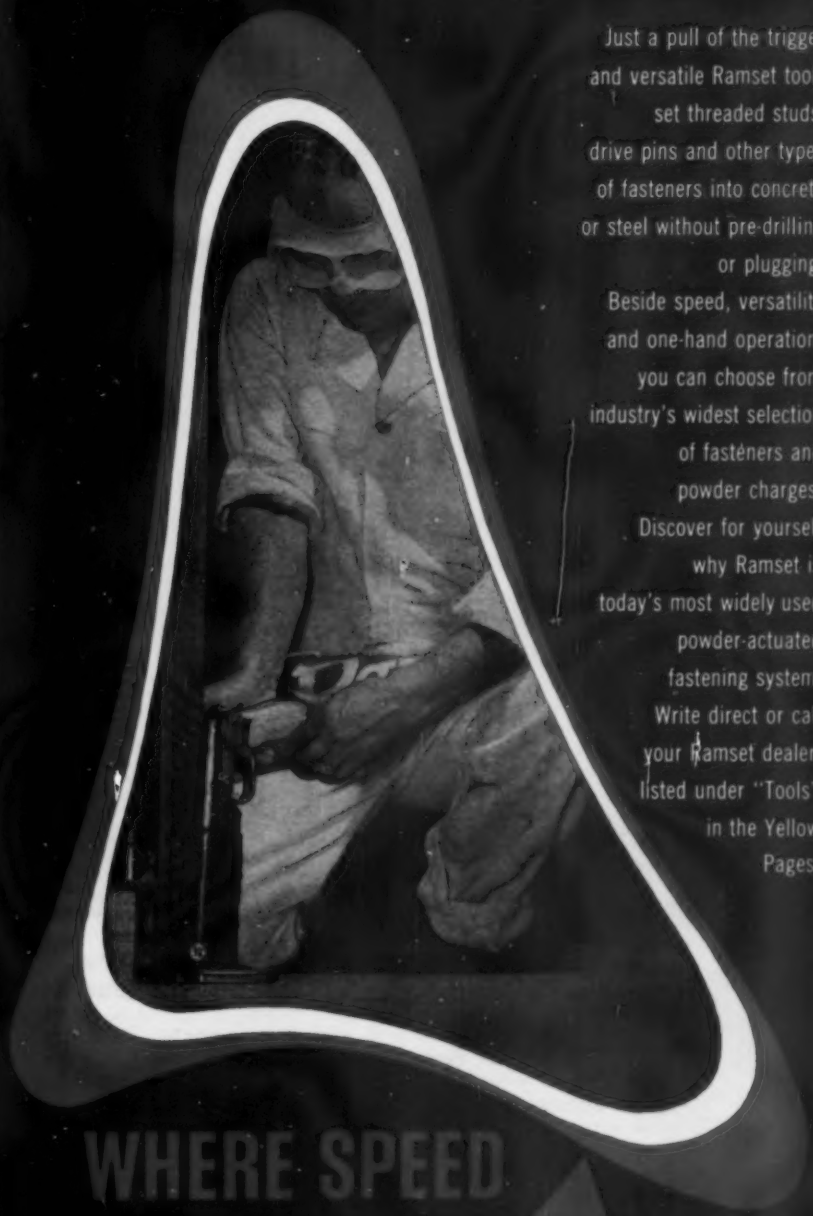
REINFORCED PLASTIC PIPE handles corrosive wastes

Duracor reinforced plastic corrosive waste pipe featuring high strength, positive sealing, lower installed cost and lasting corrosion resistance is announced for handling wastes in metalworking, chemical, textile and other industries. In the installation pictured—for waste pickling liquor with 10-15 per cent dilute sulfuric acid— the 48-in. diam. main line is over 300 ft long. The 24-in. diam. laterals join the main at factory-installed 90-deg branch entries.

Fabricated in 10-ft lengths, standard Duracor waste pipe features bell-and-spigot construction joined at the site with identical resins and ramdom fiber glass mat. Substantial savings over conventional tile or pipe are claimed, as each unit is light enough to be lifted and set in place by just two men without assistance of lift trucks, cranes etc. Depending on surface traffic, this pipe can be encased in concrete, set

For more facts circle 619 on Reply Card→

Cost-conscious maintenance men use Ramset



Just a pull of the trigger and versatile Ramset tools set threaded studs, drive pins and other types of fasteners into concrete or steel without pre-drilling or plugging. Beside speed, versatility and one-hand operation, you can choose from industry's widest selection of fasteners and powder charges. Discover for yourself why Ramset is today's most widely used powder-actuated fastening system. Write direct or call your Ramset dealer, listed under "Tools" in the Yellow Pages.

WHERE SPEED IS VITAL

Ramset® Fastening System

OLIN MATHIESON CHEMICAL CORP. · WINCHESTER-WESTERN DIV. · 294-6 WINCHESTER AVE. · NEW HAVEN 4, CONN.

Wash Windows From The **OUTSIDE** Without Disturbing People **INSIDE**

..... *And SLASH Your Cleaning Costs*

The worker has complete safety when in this cage regardless of height. He can move himself quickly to any part of a building wall.

More than 200 windows like this can be washed sparkling clean in an 8-hour day by one man in the motor-driven Cleveland Tramrail traveling unit.

IT is usually inconvenient and disturbing to have men with water buckets shuffle through busy offices when cleaning windows. It is even more annoying to have the windows opened. In the winter this allows freezing winds to come in. In the summer it upsets operation of air-conditioning equipment.

Cleveland Tramrail equipment enables washing windows on the outside without opening them. And the work can be done much faster at far lower cost. It makes the work easier for the workman and provides him with real safety. It eliminates the need of safety belts and associated dangers. It does away with heavy cumbersome ladders that must be carried, set up, climbed and taken down.

The equipment makes it simple and fast to reach any part of a wall for maintenance of any sort. Painting, pointing, caulking can be done quickly. When installed early on a new building under construction, the equipment can be so helpful with window installation and other erection work that its cost can be partly or completely absorbed in this way alone.

Cleveland Tramrail window washing and building maintenance equipment operates on a track that may be attached in various ways at the top of building walls. A carrier that rides on the track supports the worker's cage. The unit may be traveled vertically, lengthwise, and around corners, enabling the worker to reach any window or part of a wall. He requires no additional help, as he can move the unit while in the cage either by manual effort or motor drive.

Whether your building is old or new, you will discover that Cleveland Tramrail equipment offers tremendous advantages. If you are planning to build, for greatest gains, check into the equipment at once.

Write for free illustrated booklet No. 2022

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

Cleveland Tramrail Division • The Cleveland Crane & Engineering Co. • 7552 E. 290 St. • Wickliffe, Ohio

For more facts circle 620 on Reply Card

NEW PRODUCTS

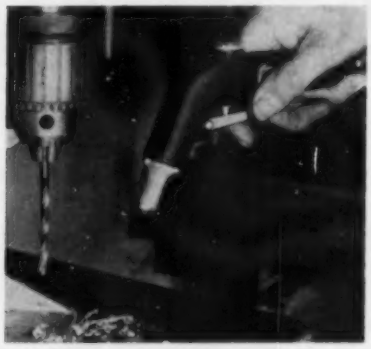
(Begins on page 206)

in a concrete cradle and backfilled with sand, or laid on sand and backfilled with sand. Duracor Bulletin 10-C provides data. The Ceilcote Co.

▲ For details, circle 30 on Post Card

BLOW GUN offers both safety and cleaning benefits

As protection against injuries resulting from the flyback of wood or metal chips, dust or cuttings during cleaning of machines or work tables with compressed air, the Saf-T-Air Blow Gun features a cyclonic whirling air action. This, in conjunction with the central concentrated air stream, forces particles down and to the sides. In effect, this sets up a conical shield of high velocity air which prevents flyback, manufacturer explains; chips and dust won't rise more than 1 in. above the surface when the gun is properly used.



Improved cleaning action resulting in reduced air consumption is also claimed. Where single orifice compressed air blow guns may require several passes to remove waste, the multi-orifice Saf-T-Gun is said to do the job in a single pass,

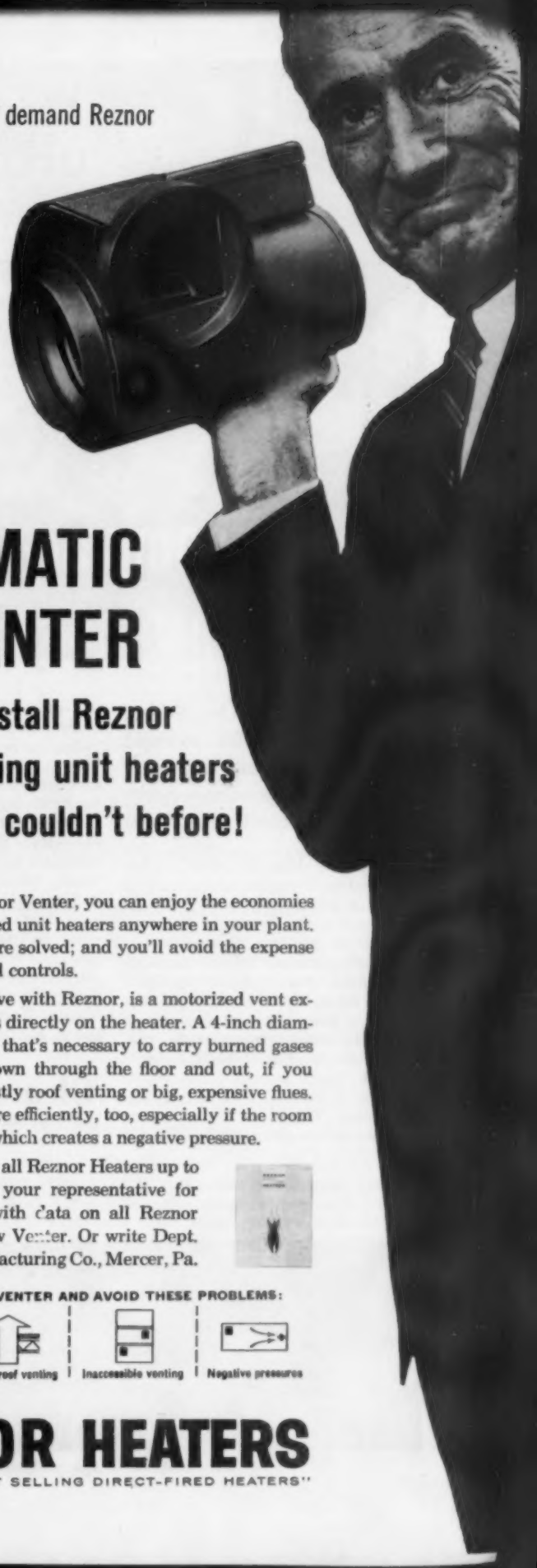
For deep crevice work extension nozzles as long as 18 in. are available. Company says the gun operates from 30 to 100 psi, depending on work performed, but has been pressure tested to 200 psi. It costs around $7.00. E. V. Nielsen Inc.

▲ For details, circle 31 on Post Card

CORROSION INHIBITOR for use in cooling systems

Dearborn 860, a non-toxic corrosion inhibitor, is announced for open recirculating and once-through cooling systems where toxic contaminants (chromate) are not permitted. Treated blowdown water from cooling towers or spray ponds can be discharged into streams, without endangering fish or animal life, it is stated. According to manufacturer,

"Tough buyers" demand Reznor



NEW AUTOMATIC VENTER

lets you install Reznor money-saving unit heaters where you couldn't before!

Now, with the Reznor Venter, you can enjoy the economies of Reznor direct-fired unit heaters anywhere in your plant. Venting problems are solved; and you'll avoid the expense of boiler, piping and controls.

The Venter, exclusive with Reznor, is a motorized vent exhauster that mounts directly on the heater. A 4-inch diameter vent pipe is all that's necessary to carry burned gases to a sidewall—or down through the floor and out, if you choose. No more costly roof venting or big, expensive flues. Heaters operate more efficiently, too, especially if the room has an exhaust fan which creates a negative pressure.

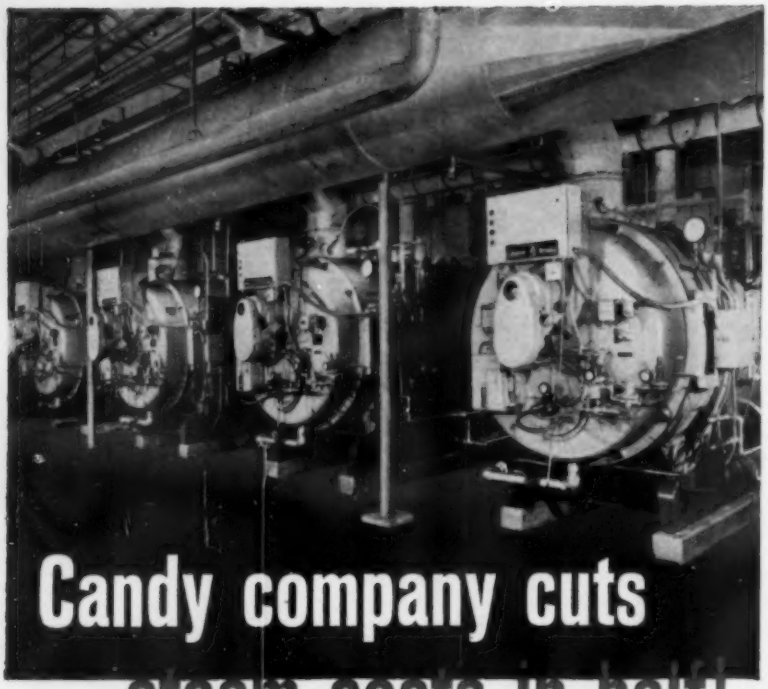
There's a Venter for all Reznor Heaters up to 300,000 Btuh. Ask your representative for Catalog SA-5900, with data on all Reznor Heaters and the new Venter. Or write Dept. 91T Reznor Manufacturing Co., Mercer, Pa.

USE THE REZNOR VENTER AND AVOID THESE PROBLEMS:

REZNOR HEATERS

"WORLD'S LARGEST SELLING DIRECT-FIRED HEATERS"

For more facts circle 621 on Reply Card →



Candy company cuts steam costs in half!

At Edgar P. Lewis & Sons, Inc., Malden, Mass., four Cleaver-Brooks packaged boilers assure a constant supply of steam at constant pressure — result is higher candy quality at lower cost

This leading New England confectioner formerly purchased its steam at a cost of $80,000 a year. Mr. Frank Reis, plant engineer, reports that since installation of four Cleaver-Brooks combination gas/oil boilers, operating costs have been reduced by half. What's more, Mr. Reis points out that having a truly dependable source of steam at constant pressure has improved the quality of his company's candies.

Steam is used for both heating and processing. Two of the CB boilers are high pressure—steam produced at 120 lbs. is piped to kettles where the candy is cooked. A pair of low pressure CB boilers operate 24 hours a day furnishing heat for the five plant buildings. Low pressure steam is also used in candy drying operations.

Day-in and day-out dependability is one feature that makes Cleaver-Brooks packaged boilers tops with food processors. Cleanliness, lower installation and operating costs, lasting high efficiency and free starting service are other big plus factors. For complete information on CB boilers (130 models, 15 to 600 hp, gas, oil or gas/oil fired) call your representative or write Cleaver-Brooks Company, Dept. H. 364 E. Keefe Ave., Milwaukee 12, Wis.

Cleaver Brooks.
ORIGINATOR AND LARGEST PRODUCER OF PACKAGED BOILERS

SWEET SAVINGS — Jelly strings, marshmallow eggs, chocolate peanuts are just a few of the quality candies made by Edgar P. Lewis & Sons, Inc. Battery of four Cleaver-Brooks boilers keeps steam costs down . . . keeps candy quality up.

For more facts circle 622 on Reply Card

NEW PRODUCTS

(Begins on page 206)

Dearborn 860 provides corrosion protection comparable to chromate-polyphosphate combinations, and superior to many polyphosphates. It forms a protective film faster to provide rapid control of pitting and corrosion. In open recirculating systems, the organic constituent of this white powder provides extra insurance against carbonate and phosphate deposits, company points out—and will interfere with crystal growth, even under severe scaling tendencies of water. It has a density of 12 lb per gallon, is slightly hygroscopic, and comes in polyethylene lined fiber drums. Dearborn Chemical Co.

▲ For details, circle 32 on Post Card

MAGNET CHAIN offers greater safety, longer service

Safety is announced as a major built-in feature of Campbell Bell-Type Magnet Chain Assembly, constructed of heat-treated alloy steel. Legs are straight at a 120-deg angle from bell

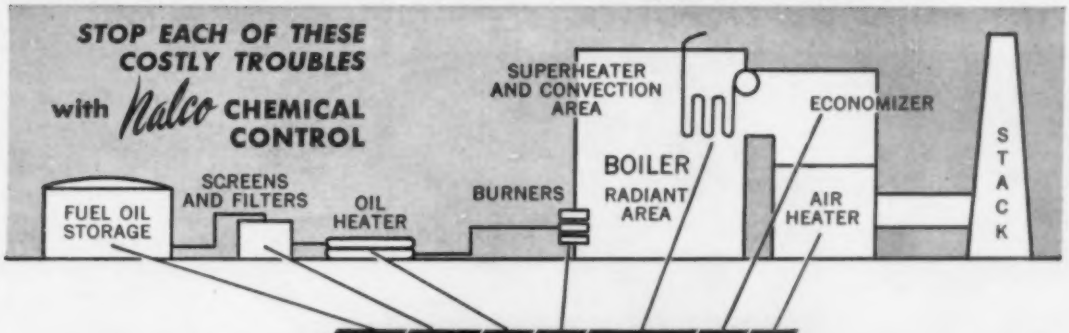
to magnet to assure even weight distribution and eliminate twists. The bell does not harden at any temperature and never requires annealing, says manufacturer, and at rest the bell stands upright. The crane hook can be engaged without help. Chain assembly is available with welded alloy coupling links or alloy Wedgloks. Use of the latter enables replacing chain legs on the job. The bell uses 1-and 1-1/8-in. chain, fits magnets up to 60 in. diam. Campbell Chain Co.

▲ For details, circle 33 on Post Card

EPOXY COMPOUND does tooling and repair jobs

This low cost epoxy tooling and repair compound is available in two types: Devcon 100, a putty-like material, and Devcon 101, a liquid. Both are said to have good tensile and compressive strength, resist most

Nalco Residual Fuel Oil Treatments Protect Boiler Systems from Storage to Stack



COMBUSTION PROBLEM	STORAGE TANK & LINES	SCREENS AND FILTERS	HEATERS	BURNERS	FURNACE AND CONVECTION SECTION	ECONOMIZER	AIR HEATER	Nalco COMBUSTION TREATMENT
Sludge Settling	X		X					Dispersant
Corrosion	X							Corrosion Inhibitor
Sludge, Varnish and Emulsion Formation	X	X	X	X				Stabilizer
Cleaning (Heavy sludge & deposits)	X							Solvent and Dispersant
Soot					X			Combustion Catalyst
Slag					X			Inhibitor for SO_2 to SO_3 Reaction and High Melting Point Materials
Low Temperature Deposits and Corrosion						X	X	Inhibitor for SO_2 to SO_3 Reaction and Neutralizing Materials

Low-cost fuel oil will not become an expensive cause of power plant maintenance and replacement costs when you put Nalco treatments to work controlling sludge, deposits, corrosion, soot, slag or acid formation. There is a Nalco treatment for each of these specialized jobs . . . to provide you with effective protection from storage to stack.

Pre-Flame System

Storage tanks and the pre-flame fuel system can be kept deposit- and corrosion-free with Nalco sludge dispersants, corrosion inhibitors and stabilizing treatments. Where sludge deposits have built up in tanks, there are Nalco treatments that will disperse them into usable fuel and recover lost storage space. Stabilizers and dispersants assure better burning by preventing fouling of burners by varnish or sludge.

Furnace and Convection Area

Soot and slag deposits are common troubles caused by untreated residual fuel oils. There is a Nalco treatment for control of each of them . . . to substantially boost efficiency and reduce mechanical cleaning costs. Combustion catalyst type treatments lower soot ignition temperatures . . . assure more complete combustion, cleaner burning. Slag deposits are substantially reduced by additives that modify the high temperature chemical reactions of ash and sulfur in the oil.

Economizer and Air Heater Sections

Keeping corrosion and acidic deposits out of economizers and air heaters was often the most difficult part of plant combustion problems to solve economically—until Nalco developed successful "cold-end" treatments. Inhibitor-neutralizers modify the chemical reactions which convert sulfur dioxide to the sulfur trioxide that creates corrosive conditions in low temperature areas.

Long Range Economy

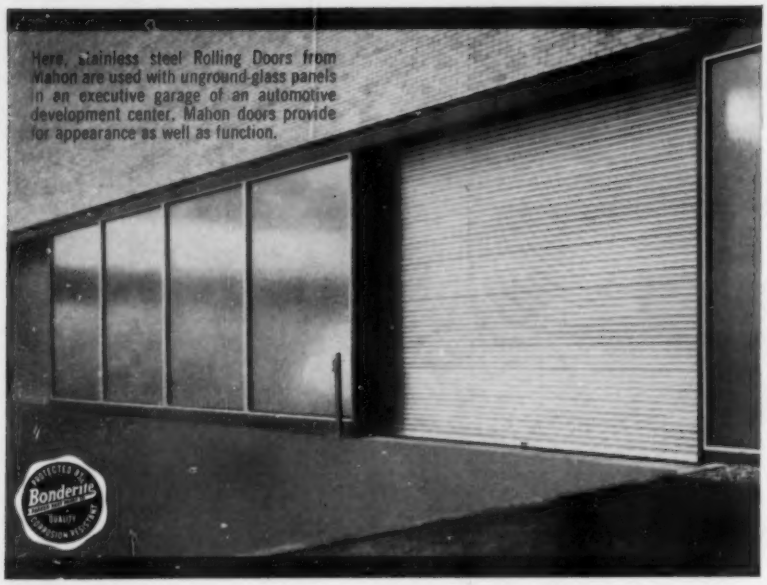
Residual fuel oils, *plus Nalco fuel oil treatments*, can build a very attractive operating-cost picture in your plant. For a flying start toward long-range fuel economy, call your Nalco Representative today, or write us for details on *specific* Nalco answers to your combustion problems.

NALCO CHEMICAL COMPANY
6217 West 66th Place • Chicago 38, Illinois
Subsidiaries in England, Italy, Mexico, Spain, Venezuela and West Germany
In Canada—Alchem Limited, Burlington, Ontario

Nalco® ... Serving Industry through Practical Applied Science

For more facts circle 623 on Reply Card

MAHON ROLLING DOORS...



Here, stainless steel Rolling Doors from Mahon are used with unground-glass panels in an executive garage of an automotive development center. Mahon doors provide for appearance as well as function.

VERSATILE SPACE-SAVERS are used with creative efficiency in any opening... any architecture

For governing the varied requirements of door openings in industrial, commercial or institutional buildings, there is no question about the unique fitness of Mahon Rolling Doors. They are available in sizes to suit your specific needs in galvanized or stainless steel, aluminum or bronze, in standard or Underwriters' labeled. Mahon doors are ruggedly built for long life, precision assembled for easy operation. The counterbalanced, vertical roll-up action means fast and effortless opening and closing—saves space and time.

Whether you're building, modifying or replacing—use Rolling Doors from Mahon . . . the doors and the inherent advantages hold up for years.

MAHON BUILDING PRODUCTS / CONSTRUCTION SERVICES

- Aluminum or Steel Curtain Walls (in natural or colored metals)
- Rolling Steel Doors (Standard or Underwriters' labeled)
- Metalclad Fire Walls (Underwriters' rated)
- M-Floors (Steel Cellular Sub-Floors)
- Long Span M-Deck (Cellular or Open Beam)
- Acoustical Metal Walls, Partitions and Roof Decks
- Steel Roof Deck
- Acoustical and Troffer Forms
- Permanent Concrete Floor Forms
- Structural Steel-Fabrication and Erection
- Steel Fabrication-Weldments

THE R. C. MAHON COMPANY / *DETROIT 34, MICHIGAN*

Manufacturing Plants—Detroit, Michigan and Torrance, California
Sales-Engineering Offices—Detroit, New York, Chicago, Torrance and San Francisco
Representatives in all principal cities

FULL SPECIFICATIONS IN SWEET'S OR WRITE FOR MAHON ROLLING DOOR CATALOG D-60.

MAHON

For more facts circle 624 on Reply Card

NEW PRODUCTS

(Begins on page 206)

chemicals and oils, and bond to all types of metals, wood, ceramics and other materials. Applications include repairing damaged machinery, foundry patterns and core boxes, and other uses where high strength and light weight are desired. It is also suggested (as core material or by itself) for making patterns, dies, core boxes, holding fixtures. Each unit is packed with right amount of hardener and release agent. Devcon Corp.

▲ For details, circle 34 on Post Card

CORROSION INHIBITORS improve cooling water control

Two polyphosphate-chromate corrosion inhibitors feature an organic additive—Endcor A—to provide improved control of corrosion and deposits. Polychrome 501 is intended primarily for use in open recirculating systems employing heat exchangers that appreciably raise the temperature of the cooling water. Polychrome 505 is for open recirculating systems when relatively low temperatures are encountered. According to manufacturer, the organic additive bolsters protective films and has surface active properties which interfere with carbonate and phosphate deposit formulation; as a result, pH of cooling water can be higher and smaller amounts of acids are required. Both products are described as orange-brown, having a density of about 12 lb per gallon, and indefinitely stable in a closed container. Dearborn Chemical Co.

▲ For details, circle 35 on Post Card

ALUMINUM COATING gives improved roof protection

Tests are reported to show that Revco Liquid Aluminum Coating reduces below-roof temperatures as much as 20 deg. It is more effective than many aluminum roof coatings, says manufacturer, and forms a shield that deflects the sun's rays, turning back 71 per cent of the sun's heat. Efficiency of coating is attributed to use of bright, long lasting Alcoa aluminum pigment. Revere Chemical Corp.

▲ For details, circle 36 on Post Card

DUST SUPPRESSOR for the small industrial services

For single point dust suppression or controlled wetting of raw materials, Chem-Jet Portable Dust Suppressor can control dust at truck unloading areas, crushers, conveyor transfer points, mixers and other dust gen-

Safety Mineral Insulated Cable for a greater variety of 600 v applications than any other wiring system*

MI Water Resistance: Impervious to water, steam, oils and solvents, MI is ideally suited for installations where these factors cause ordinary cables to break down. MI has helped eliminate costly shutdowns in dairies and food processing plants where washdowns are a daily function. **MI Heat Resistance:** Unlike any other cable system, the limiting factor for MI heat exposure is the copper components of the cable. The magnesium oxide insulation is heat-stable until well over twice the melting point of copper (1083C). With an MI system as opposed to conduit there is no need for circuitous routing to avoid contact with boilers, machines and other sources of heat. Cable operating temperature is 250C, but standard general application (Type O) and hazardous areas (Type H) seals are limited to 85C. **MI Flexibility:** No need for factory-made conduit bends...MI can be hand formed on the job and easily clipped into position. MI is able to withstand severe twisting, bending and deforming pressures because the conductors cannot shift within the highly compressed magnesium oxide insulation. For a copy of our new MI catalog, write **General Cable Corporation**, 730 Third Avenue, New York 17, N.Y. Manufacturers of MI Cable since 1941. Mineral Insulated Cable Division

Approved for hazardous areas in the 1959 National Electrical Code, Articles 330, 501, 502 and 503

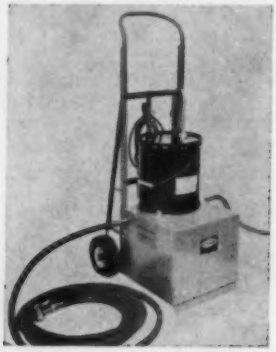
For more facts circle 625 on Reply Card

NEW PRODUCTS

(Begins on page 206)

erating points. Four models are available, each including a proportioner, mixing chamber and auxiliary controls mounted on a hand truck. The four designs, two manual and two automatic controls, cover both local or remote operation. If desired the truck can be removed and the installation made permanent.

The proportioner can be factory adjusted to dispense 1 to 11 gpm of



non-toxic dust suppression solution. The standard unit delivers 6 gpm of solution when attached to plant water supply at 40 psi. The unit is shipped assembled, less the 5-gal drum of Compound R, shown in the photo. Minutes amounts of compound are combined in the mixing chamber with water to make up the dust suppression solution. The Johnson-March Corp.

▲ For details, circle 37 on Post Card

Use the Reader Service Cards provided on pages 245-246 to ask for more information on any of these products.

EPOXY COATINGS are easy to apply, solventless

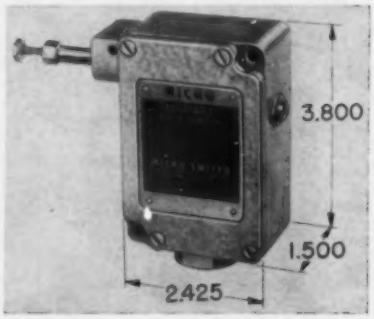
Explosion-proof epoxy resin coatings —Resiweld Series 250— are announced for protection against weathering, acids and abrasion. These two-part formulations are said to combine toughness, attractiveness and standard application procedure. According to manufacturer, they are highly resistant to water, brine, weathering, abrasion and most solvents, chemicals and acids, and have a smooth, tile-like appearance.

Two of the coatings—clear (250) and white (251)—can be tinted almost any color. An orange shade (259) is available for use as a corrosion-inhibiting iron and steel primer. Coatings can be applied with spray equipment, or by brush, roller, knife or dipping. A single coat of 5-to 15-mil thickness is considered adequate for most jobs. The coatings have a 3-to 7-day pot life, cure at normal room temperature. They can be applied to nearly all surfaces. Manufacturer recommends them for concrete walls and floors where resistance to alkalis and chemicals is needed, for line processing equipment, tanks and pipelines etc. Bulletin TTB-15C gives more information on these coatings. H. B. Fuller Co.

▲ For details, circle 38 on Post Card

ADJUSTABLE PULSE SWITCH for industrial application

This pulse-producing snap-action switch (Catalog 1 PDI) is designed for use where monentary opening and/or closing of a circuit is necessary, and for controlling pneumatic valves where permanent-duty solenoids are not used. The entire pulse operation occurs as the plunger is depressed; no switching action takes place on the return stroke.



Mechanical characteristics include 0.600-in. minimum total plunger travel, 4-lb operating force and 8-lb full overtravel force. Pulse length is adjustable from 0.030 to 0.450 in., the adjustable plunger can be extended 0.750 in. The switch is sealed against oil, water, dust and dirt. Electrical characteristics of the single-pole double-throw switch are 10 amp at 125, 250 or 480 v a-c; ½ amp at 125 v d-c; ¼ amp at 250 v d-c. Micro-Switch, Div., Minneapolis-Honeywell Regulator Co.

▲ For details, circle 40 on Post Card

SPARE PARTS KIT for the battery chargers

This spare parts kit, for company's line of vertical motor-generator chargers, contains parts commonly replaced after long use in electric motor equipment. It comprises a full set of brushes, two bearings and a fuse. There is a kit to fit each of the 25 sizes of chargers. Exide Industrial Div., The Electric Storage Battery Co.

▲ For details, circle 41 on Post Card

MAGNETIC MEMORY DISC has broad application

Magnestat is announced as a simple and rugged magnetic memory system without electronic parts, providing complete control of grading, filling, marking, wrapping, stamping, etc. on conveyed products of any type or size. It is adaptable to many material handling applications where a time delay factor is present. Manufacturer says that it can be activated manually, by limit switches, or by weight or size of conveyed material, to enable a processing decision to be made at one point in the production line and then, by storing this decision on the disc, to assure automatic execution of the desired operation at a later stage in production. In a typical application in the lumber field, the Magnestat is used with sawmill trimmers. The operator stands behind a push button control console. As rough-cut lumber passes on the chain, he pushes a button while the board is in front of him to automatically operate the correct saw in battery of trim saws, making the proper cut in the board. Republic Electric & Development Co.

▲ For details, circle 39 on Post Card

DOMED SKYLIGHT made of flame-resistant plastic

The fire-retardant version of company's Consolite, a translucent skylight, is designed to provide maximum safety in fire-hazardous areas. It is also claimed shatterproof and crackproof, and to have excellent strength and weathering qualities. The unit is made of an inherently fire-resistant and self-extinguishing polyester resin —Hooker Chemical Corp.'s Hetron 93-LS—and is fiber glass reinforced. According to manufacturer, it will not support combustion and, even if

ALLIS-CHALMERS

Now — faster, easier hookup with new, 3-piece case design.

All-new dry-type transformers

...on the wall, wired, closed in half the time!

Now 35% smaller, lighter — new Allis-Chalmers ventilated, dry-type transformers feature exclusive 3-piece case that cuts installing time from 90 to *just 40 minutes!* New, compact size opens additional installation site possibilities previously considered too tight for conventional units.

Noise level is reduced to no-hum, whisper-quiet operation by employing core impregnation... by isolating core-and-coil assembly from the case... and by use of nonresonate casing. Low core losses and low exciting current result from superior *Curvacore* construction.

This new 600-volt class indoor transformer line is available in 3- to 50-kva sizes for on-the-site load center applications where critical voltage must be maintained. And the price is right!

Further details are available in Bulletin 61B8222A at your nearby A-C office, or write **Allis-Chalmers,** Power Equipment Division, Milwaukee 1, Wisconsin.

Curvacore is an Allis-Chalmers trademark.

A-1359

(Begins on page 206)

ignited by direct application of flame, will extinguish itself once the source of flame is removed. Sparks or embers will not ignite it, company points out, and it is unaffected by industrial fumes, salt water and ordinary cleaning detergents. Weatherability is increased by coating it with Hetrolac 105, an acrylic lacquer containing ultra-violet absorber.

Available in pale green or mist white, single-or double-dome construction, the Fire-Retardant Consolite comes in several mounting styles: rectangular, square and round low self-flashing types; rectangular high self-flashing types; and square and round curb-mounting types. They are designed for roof openings ranging from 14-by-14 in. to 38-by-74 in. Consolidated General Products, Inc.

▲ For details, circle 42 on Post Card

FILTERING MEDIA is extra fine and light

Said to be the finest filtering media produced for commercial purposes, Fiberglas Air Filter, Type 004.12 is designed for use where a higher than normal degree of air cleaning is required. Performance is equivalent to that of the electrostatic method, manufacturer points out; also this media can be used in certain applications for which the electrostatic method is not suitable. Among uses are in air conditioning systems in which ultra-high efficiency is desired. The product comes in widths up to 72 in. Owens-Corning Fiberglas Corp.

▲ For details, circle 43 on Post Card

AXIAL FLOW FANS have quick-change features

Since ventilation systems are frequently altered during their life, usually to increase capacity, this company offers belted axial flow fans to simplify this change. A bearing assembly suitable for loads to 50 hp is furnished with each fan, regardless of initial horsepower ordered. Also, the universal motor mounting plate is pre-drilled for all motor frame sizes the fan can accommodate, Both standard and high pressure propellers are available, depending on system requirements, all with aluminum-magnesium alloy cast airfoil section blades. Fans range from 30 to 60 in. and air deliveries are available to about 85,000 cfm. Other features permit use in temperatures to 350 F without special accessories. Company says the fans are Factory Mutual approved for use in explosive atmospheres and special coatings are available for in-

HIGH PRODUCTION...HIGH QUALITY PRODUCT

According to Morgan Adhesives Co., Stow, Ohio, close temperature control in each of the 6 zones is instrumental in achieving quality never before obtainable.

Used for curing and drying self-adhesive print stocks, foils and plastic film papers, the Sly Continuous Oven provides high speed production with a minimum of manpower—primary pay-off and take-up operations are located at one end. Safe handling of hazardous material, around-the-clock operation, and space-saving overhead installation are other features.

Sly designs ovens for every need. Send us your requirements. Put our experience to work for you. Or write for Bulletin 200.

THE W. W. SLY MANUFACTURING CO.
4600 Train Avenue • Cleveland 1, Ohio • Offices in Principal Cities

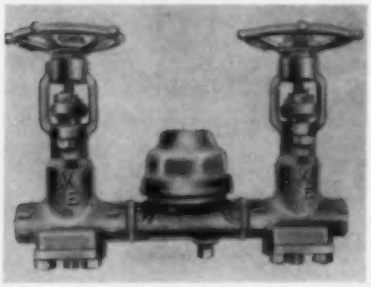
For more facts circle 627 on Reply Card

terior fan surfaces when handling corrosive or abrasive exhaust. Propellair Div., Robbins & Myers, Inc.

For details, circle 44 on Post Card

STEAM TRAP unit includes valves and strainer

Worthwhile savings are claimed through use of the Type TSV Piping King where only two connections are required to make a complete steam drainage installation. The assembly consists of a forged steel steam trap with integral strainer, check valve



and air vent, welded to either one or two forged steel gate valves. Both trap and valves are serviceable in the line, company states, and in less time than it would take to remove a standard valve or trap. A one-piece cage unit contains all steam trap internal parts, and the removal of two screws permits replacement of every part except the body without touching a line connection. Shut-off valves are bonnetless design with screwed-in seats of stainless steel. According to manufacturer, labor savings to 90 per cent and material savings of 60 per cent can be realized on original installations. Type TSV Piping King comes in ⅜-to 1-in. connection sizes for pressures to 250 psi. Velan Steam Specialties, Inc.

For details, circle 45 on Post Card

SILICON RECTIFIER, water cooled, for large applications

Introduced for large electrochemical and industrial uses, this water-cooled silicon rectifier has compact water-to-water heat exchange equipment and can be located anywhere in the plant. Its cabinet can be sealed against dust, dirt or corrosive gases. The unit has water-cooled bus bars on which the rectifier cells are mounted, permitting removal of the cells without disturbing the cooling system which includes the heat exchanger, motor-driven pump, water expansion tank, water pressure switch, temperature regulating and drain valves, insulating hose.

Alternate systems are available for direct raw water cooling and a recirculating cooling system using a water-to-air heat exchanger. Surge capacitors are used in the water-cooled rectifier to eliminate voltage surges, and high speed current limiting fuses protect rectifier cells. Allis-Chalmers Mfg. Co.

For details, circle 46 on Post Card

ANALYZER monitors trace solids in feedwater, condensate

This automatic tape analyzer, is designed to detect trace solids in feedwater and condensate. Current Model 302 monitors insoluble solids but can be modified for solubles, company says, and possibly for radioactive particles. It is based on the Millipore filter test method in which particulate material is quantitatively removed from a liquid or gaseous sample by an ultra-fine filter membrane and retained on the filter surface where it may be identified.

The tape analyzer automates this test by filtering sample in sequence through a nylon-backed tape of filter membrane, and printing the time each sample is taken. Basic data produced is a circular discoloration on the tape made by solids extracted from the filtered fluid. Degree of discoloration, proportionate to insoluble solids con-

P&S TURNLOK

Built to Take It

P&S TURNLOK wiring devices are designed to give trouble-free service no matter how tough the going gets. TURNLOK devices are available in 10 and 20 Amperes, 2-, 3-, and 4-wire types: receptacles, connectors and caps.

All P&S TURNLOK devices have extra large head binding screws and ample wireways for quick, easy wiring. Armored sections are anchored securely. Cap blades are positioned accurately. Contacts are anchored securely. Fastening screws in connectors are secured in body . . . cannot fall out in wiring. Ratings are plainly visible.

For information about P&S TURNLOK Line, write Dept. PE-76.

PS PERFORMANCE SPECIFIED

P&S PASS & SEYMOUR, INC.
SYRACUSE 9, NEW YORK

60 E. 42nd St., New York 17, N.Y. 1440 N. Pulaski Rd., Chicago 51, Ill. In Canada: Renfrew Electric Co., Ltd., Toronto, Ontario

For more facts circle 628 on Reply Card

NEW PRODUCTS

(Begins on page 206)

centration, can be calibrated by analyzing a portion of a sample and then running another portion through the tape analyzer. A strip chart recording attachment is also available.

The analyzer has varied power plant application. On startup and restarts it can serve as a basis for estimating amount of rinse required, can signal when system is clean and record cleaning effectiveness. During operation it can keep operators informed of level of insoluble solids in the cycle and forewarn of possible trouble. In trouble shooting, it can pinpoint the location of solids pickup. As a control instrument, it can measure effectiveness of filters, signal need for cleaning. Graver Water Conditioning Co.

▲ For details, circle 47 on Post Card

CURING AGENT, SEAL for new concrete floors

Besides serving as both curing agent and seal, Tremcrete further reduces installation costs by eliminating constant wetting down of concrete during curing stage, as well as the use of straw, burlap or paper. In one application, Tremcrete provides a high degree of water retention in the concrete while the cure takes place, says manufacturer; it exhibits superior abrasion resistance while building is being completed and for some time after, and it resists dusting, solvents and alkalies. Paint, linoleum, asphalt tile, etc. can be applied on the floor as soon as construction is finished, it is stated. According to manufacturer, Tremcrete can be applied to new concrete floors 10 to 12 hr after troweling, it dries tack free within 3 hr. The Tremco Mfg. Co.

▲ For details, circle 48 on Post Card

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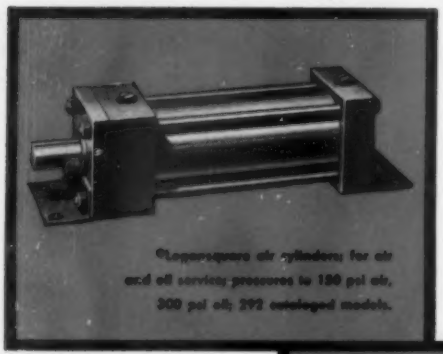

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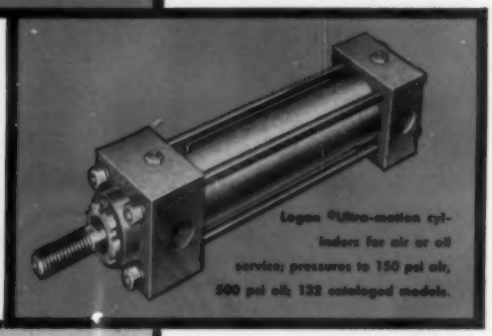

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- ☐ 100-6 ULTRAMATION CYLINDERS
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- ☐ 200-1 HYD. POWER UNITS
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A down-to-earth 20-page booklet on the "rights" and "wrongs" in setting up and servicing air and hydraulic equipment.

MEMBER: National Machine Tool Builders' Assn., National Fluid Power Assn.

For more facts circle 629 on Reply Card

AIR HOISTS in push type trolley suspension models

Air hoists with integral push type trolley suspensions, in ¼-½- and 1-ton sizes, are recent additions to this manufacturer's Budgit line. They have push type trolleys mounted directly on the hoist frames in place of upper

suspension hooks, an arrangement said to eliminate hoist sway, promote smoother traversing and better load spotting. Also, a headroom advantage of an extra 2 in. is gained over conventional method of hanging the hook type model hoist on a separate trolley. Among construction features are aluminum alloy, frame, vane type air motor, shoe type load brake, one-hand pendant control, and limit stops. Bulletin 15010-24A-58 gives data. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

▲ For details, circle 49 on Post Card

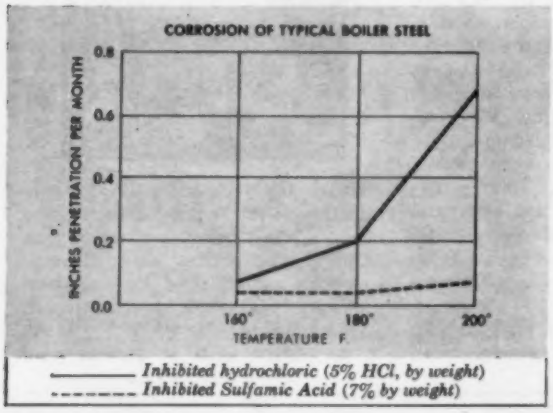
STAINLESS METER speeds corrosive-liquid batching

The 1½-in. Stainless Steel Auto-Stop Meter is designed to provide automatic controlled measurement of predetermined quantities for batching and processing systems where corrosive liquids, such as acids and

Descale boilers, heat exchangers, condensers rapidly, thoroughly with safer **dry acid** cleaners based on **Du Pont Sulfamic Acid**

SAFER TO HANDLE. Just pour dry acid cleaner based on Du Pont Sulfamic Acid from easy-to-handle, fiber drum into make-up tank. No danger from broken bottles, liquid spillage or corrosive fumes with these dry powders.

EASIER TO USE. Simply pump cleaning solution from make-up tank into boiler. Often dry acid cleaners can be added directly to equipment being cleaned. No elaborate equipment or specially trained labor needed.



LESS CORROSIVE. Sulfamic cleaners approach the strength of hydrochloric acid, yet are far less corrosive. Excellent inhibitor stability allows their use at higher temperatures for faster scale removal.

NON-FUMING. Sulfamic cleaners produce no corrosive fumes, either dry or in solution. Corrosion in vapor spaces of equipment during cleaning operation is eliminated, along with fume nuisance to personnel.

Ask your supplier for safer, effective cleaners based on Du Pont Sulfamic Acid, or mail coupon for additional information and names of formulators who offer these compounds.

E. I. du Pont de Nemours & Co. (Inc.)
Industrial & Biochemicals Dept., N-2533PE
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Please send me ☐ sulfamic acid general equipment cleaning bulletin; ☐ names of formulators offering cleaners based on sulfamic acid.

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For more facts circle 630 on Reply Card

NEW PRODUCTS

(Begins on page 206)

alkalis, are used. It functions almost automatically, manufacturer states—all you do is press buttons on the register face to set the quantity and open the valve. The liquid flows unattended until the preset quantity is reached: then the valve cuts off flow. The meter is based on the positive displacement principle with only one moving element exposed to the liquid. It has a capacity range from 20 to 100 gpm, comes in a choice of models, and can be calibrated for U. S. or Imperial gallons, liters or pounds. Neptune Meter Co.

▲ For details, circle 50 on Post Card

ALUMINUM SPRAY PAINT, in colors, fast drying

Dri-Spray Aluminum Paints come in five colors as well as natural aluminum. Sprayed on wood, metal, concrete or plaster, Dri-Spray Aluminum dries to the touch in 5 min. Overspray dries instantly and falls as a harmless dust. Tropical Paint Co.

▲ For details, circle 51 on Post Card

MEGAPHONE is transistorized, self contained

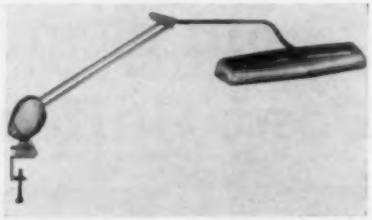
Model A-12 Voice Gun weighs only 3¼ lb and is a self-contained public address system consisting of magnetic

microphone, transistor amplifier, paying-type speaker and power supply, all in a unit compact enough to be held in one hand. Because its horn, handle and mouthpiece are made of molded Cyolac, the Voice Gun is claimed virtually unbreakable. It is designed to function in summer heat and sun, in rain and snow and in sub-zero cold. The gun is "armed" with eight low-cost penlight batteries which are slipped into a removable clip and last up to a year in average use. Wm. A. Holmin Corp.

▲ For details, circle 52 on Post Card

FLOATING FLUORESCENT LIGHT features finger-tip adjustment

This adjustable Faries fluorescent light is suggested for drafting boards or wherever glare free adjustable lighting is desired. It positions instant-



ly and stays put without loosening or tightening of any connection, says manufacturer, and arm and shade both rotate a full 360 deg without twisting cord. A louvered shade provides ventilation and soft diffused upward lighting, and also serves to vent dust upward, increasing tube efficiency. The light is described as extremely rugged. Fixture can be mounted on any vertical, horizontal or sloping surface by means of a universal mounting clamp and leveling thumb screw. An accessory bracket adapts base for wall or drafting board mounting. The light accommodates two T8 15-w 18-in. tubes, comes in bronze or gray, for regular or 95 per cent power factor. Fostoria Corp.

▲ For details, circle 53 on Post Card

POCKET RADIO requires less battery power, weighs less

Voice Director is described as an all-transistorized shirt-pocket radio communications receiver with miniaturized circuitry that boosts audio efficiency and requires 35 per cent less battery power than previous hand-carried message equipment. It weighs only 12 oz with battery. Although power consumption is reduced, this device is claimed to have receiver selectivity and sensitivity comparable to larger mobile radios.

On standby, the Voice Director uses only 32.5 mw (5 milliamperes at 6½ v) as compared with more than 50 mw in many pocket radio designs. While a message is being received, the power drain is 58.5 mw, reportedly one-sixth that of previous units. For indoor and outdoor voice-paging, the equipment enables the person wearing it to be contacted by a base station transmitter, a two-way radio in a car, or portable unit operating on the same frequency. Initially frequencies will be in the 150-174 mc range.

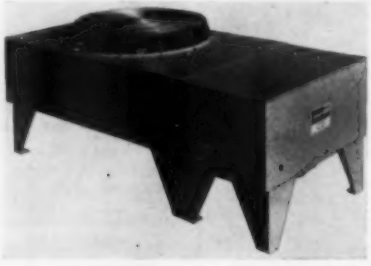
Because less power is used, a smaller battery—a 6½-v single mercury type—is used. Contributing to the Voice Director's reduced power requirement and energy storage is a ferrite loop-stick used for an antenna,

built in the receiver's case. A tiny directive horn, which clips to the lapel, is used when privacy is not required. Use of the "directed voice speaker", reduces need for extra amplification in the receiver itself. General Electric Co.

▲ For details, circle 54 on Post Card

CONDENSING UNIT in low silhouette design

The LSCU is available in five basic sizes, 10 through 30 tons, specifically



designed for air conditioning applications requiring use of water savers. It is basically a standard low silhouette blower condenser, complete with a Brunner-Metic motor-compressor, Heat-X liquid receiver, electrical controls and refrigeration accessories mounted in a special section for field attachment or remote installation. These units can be located anywhere without regard to prevailing winds. Air movement, up and out, means minimum noise rating and no objectionable air flow toward neighboring building, company states. All enclosures are designed for outdoor use and easy accessibility. Bulletin 7017-1 describes unit. Dunham-Bush, Inc.

▲ For details, circle 55 on Post Card

Right, PPG insulation is easily cut to size on the job. Left, Foreman Charles W. Booth, of Acheson Sheet Metal Company, supervises installation of ductwork. PPG Neoprene-coated Duct Liner meets all requirements of NBFU Bulletins No. 90-A and 90-B for ducts, and bears the label of Underwriters' Laboratories, Inc.

The inside story on a hush-up job in Tampa

(with PPG Fiber Glass Insulation, of course!)

It will be quiet, as well as comfortable around the new State Agency Building at Tampa, Florida, because PPG Fiber Glass Insulation has been installed in the ductwork of the heating and air conditioning system.

Job foreman Charles W. Booth of Acheson Sheet Metal Company, Jacksonville, installers of the ductwork, reports that the long life-expectancy of PPG Neoprene-coated Fiber Glass is of great importance in the choice of this insulation, because of the difficulty of replacement in a duct system.

It's what's inside that counts!

Mr. Booth says that PPG Insulation has extraordinary sound-deadening qualities which eliminate fan noise, has excellent thermal-barrier characteristics, and low resistance to air flow. In addition to ease of handling and installation, it will not be affected by humidity, won't swell, rot or decay . . . very important in Tampa-types of climates!

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Available in a range of sizes, densities, and facings to meet any insulation specification. For more information, contact your nearest Fiber Glass Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Penna.*

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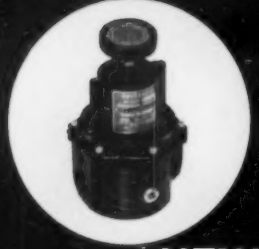

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For more facts circle 632 on Reply Card

New Plant Construction

(Continued from page 162)

start of construction, with rolling operations to start about two months later. Plant when completed early next year will cost approximately $3.2 million.

Falls City, Texas—Susquehanna Western, Inc., Denver, Colo., will begin construction at once on a $2.5 million uranium processing plant on large tract of land near this city. Construction will be completed by mid-1961 and, when in production, will process about 200 to 250 tons of ore per day, for sale to the Atomic Energy Commission.

Hereford, Texas—American Crystal Sugar Co., Boston Building, Denver, Colo., plans to construct a new mill for the production of beet sugar on large site here. Construction of the new plant will begin soon for completion by the latter part of 1961. Plans call for the inclusion of a paved mill area and automobile center and a company-owned private water system. Complete cost of the project reported to be $12 million.

Houston, Texas—Air Reduction Co., 150 E. 42nd St., New York, N. Y., plans to construct a plant here, where company presently has a small oxygen plant. New air separation plant will have a capacity of 25 to 150 tons of liquid oxygen, 2 to 25 tons of liquid nitrogen and 1 to 5 tons of liquid argon per day. Work on the new facility will begin soon for completion in the spring of 1962. Cost of the new plant reported to be about $3 million.

Saltville, Va.—Olin Mathieson Chemical Corp., Mathieson Building, Baltimore, Md., plans to construct a multi-million dollar plant for the production of anhydrous hydrazine, on large building site recently acquired by the company. Work on the new plant will begin soon. Plant is scheduled to go into production early in 1962.

Seattle, Wash.—United Control Corporation, 4540 Union Bay Place, this city, plans to construct an engineering and manufacturing plant to be located on large building site here. Work on the plant will get under way at once and is scheduled for completion by the early part of 1961. Cost of the new plant is reported to be in excess of $1.67 million.

Cody, Wyo.—Big Horn Gypsum Co., headquartered in Salt Lake City, Utah, plans to construct a gypsum board plant, work on which is already under way. Facility will have a production capacity of 100 million board feet of gypsum wall board annnually. Plant is scheduled to go into production early next year. Cost of the new plant with equipment reported to be $3 million.

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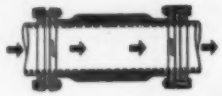
PINCH VALVES

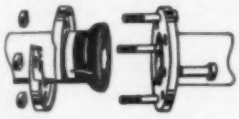
RUBBER, NEOPRENE
for Corrosion and Abrasion

- 1" to 14" inside diameter.
- Pressures to 150 psi.
- Temperatures to 200° F.
- Patented "hinged" sleeve. Recesses serve as "hinges" during compression; reduce strain and permit tight closing.

- Cannot leak or stick.
- No working parts in contact with pulp or liquid; no packing glands.



- Unobstructed flow eliminates high friction loss.
- Remote control available.
- Can be equipped for automatic regulation.



- Split flanges and patented Flex Seal ends assure perfect seal.
- Closing mechanisms,... manual handwheel; handwheel with chain and sprocket reduction unit; electric worm gear motor reducer; chain operated torque arm reducer; hydraulic air-hydraulic.

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For more facts circle 633 on Reply Card

Emergency Shutoff Valves

(Continued from page 130)

The current output of a thermopile, Fig. 7, operates a small pilot valve to allow line pressure to close a small valve. These valves are used extensively on domestic heater gas lines and are popular due to being self-energized by the pilot light of a heater.

Innumerable combinations of the principles of valve body and actuator design summarized in this article are available. Selection should be governed by the criteria outlined with emphasis on simplicity. The mistake that was made in a wartime plant should not be duplicated. In this plant, the emergency control system became more complicated than the initial operating controls; and upon analysis, would require more service man-hours and had less possibility of dependable functioning than the operating system.

The only function of an emergency shutdown valve is to shut off with finality when triggered by a device which senses an unsafe condition. Unless the valve is serving a control function in addition, it should have sufficient capacity to allow maximum required flow without causing enough pressure drop to interfere with other control functions. This has contributed to the popularity of the swing-check, full-flow plug or butterfly valve. Body and trim materials must be selected for low erosion or corrosion in the service encountered.

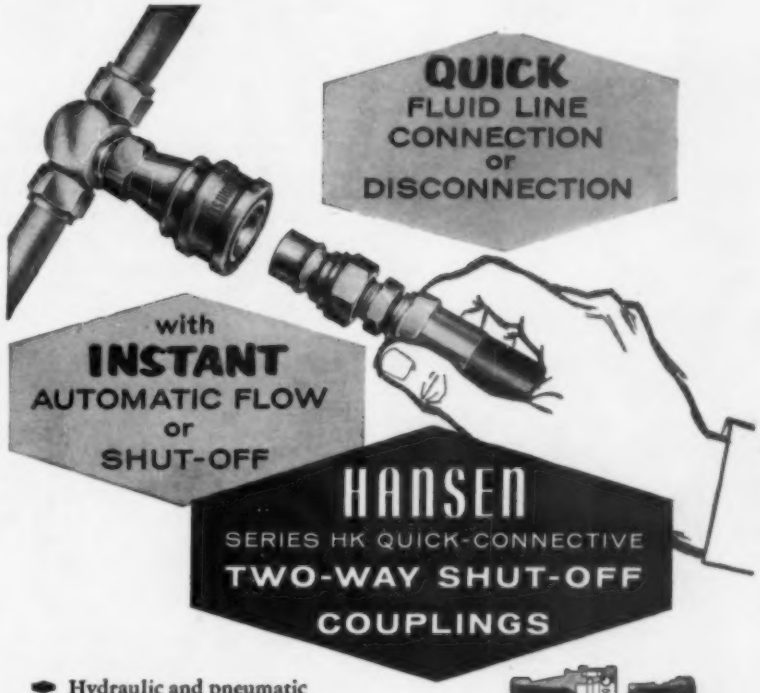
It is fine to say that a mechanical device is maintenance-free, but it is unrealistic to believe that it is possible to foresee all abnormal operating conditions. Such things as voltage reductions, feedbacks due to control circuits, rocks, bolts, or only rags in the line, damage to instruments or valves during installation are inevitable. A very complete checkout before placing in service is in order. Preventive maintenance should include operating the equipment by simulating the abnormal condition. Piping without use of unions or flanges that facilitate removal of valves for inspection or wiring without switches that allow for cleaning or inspection are doubtful economies. **End**

Fluid Power Maintenance

Various phases of fluid power maintenance are discussed in this 48-page reprint of a series of articles which have appeared in past issues of Plant Engineering.

The series covers all facets of fluid power maintenance from the installation of hydraulic systems to the maintenance of individual units in a system. Here is a brief listing of some of the 12 articles appearing in this reprint: How To Care for Hydraulic Pumps, How To Maintain Hydraulic Valves, Accumulators and Intensifiers, Maintaining Hydraulic Cylinders, Compressors, Filters and Lubricators, Air Control Valves and Spare Parts.

Price for this booklet is 75 cents. If you would like to have a copy of this series for your own file, send your request to the Editor, Plant Engineering, 308 E. James St., Barrington, Ill.



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When Coupling is disconnected, valves contact valve seats in both Socket and Plug to provide instant and positive seal of fluid in both ends of line. Coupling does not depend upon line pressure to seal either end of line.

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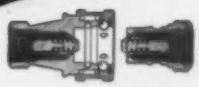

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for the plant engineer

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ENGINEERING CATALOG D 60. Size 7⅜ by 5½ in. approx; 468 pp; illustrated; paper bound. Published by Dodge Manufacturing Corporation, Mishawaka, Indiana.

THIS PUBLICATION acquaints users of Dodge equipment with both new and established products. It has engineering drawings, dimensions, weights, prices, technical data, and selection and application information. Requests for the catalog should be made on company letterhead.

Among the items on which information appears in this catalog are the following: pillow blocks, chains, clutches, couplings, pulleys, shafting, speed reducers, belts, sprockets, and sheaves. A detailed index of the contents appears at the end of the catalog, extending through seven pages.

The engineering data section includes flywheel formulas, torque and horsepower equivalents, tables for selection of shaft diameters, and a table of average properties of standard steels.

Pump Application Manual

CENTRIFUGAL PUMP APPLICATION MANUAL. Size 6⅞ in. by 4½ in.; 277 pp; illustrated; cloth bound. Published by Buffalo Pumps, Division of Buffalo Forge Company, Buffalo, New York. Price: $5.00.

A BRIEF but informative treatment of centrifugal pumps is given in this handy manual, touching on applications in industrial fields. It includes definitions on pump terms, discussions of mechanical seals, and noise in centrifugal pumps and pumping systems.

The book contains a list of pump troubles and corrections which can be used as a reference for overcoming possible difficulties with a newly installed unit. Conversion factors, formulas, curves and a chart of packing recommendations appear in the contents.

Areas of pump usage with which the book deals are: paper stock pumping; sewage handling; chemical and sugar industries; fire protection; and hot water pumping. A little over half the book is taken up by the Centrifugal Pump Section of the Standards of the Hydraulic Institute.

Among the topics on which information is contained in the section are: rating standards; installation, operation, and maintenance instructions.

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Offset Nipples

Added wire protection, faster and easier pull-through . . . you can now get these added benefits on a complete line of top-quality malleable iron Gedney connectors. Gedney Insulated Throat Connectors eliminate fraying and snagging . . . leave wire smooth and safe.

Gedney fittings are made from top-grade malleable iron. They're unmatched for toughness and are impervious to corrosion. Each Gedney product must pass rigid inspections.

GEDNEY FITTINGS FIT

GEDNEY
ELECTRIC COMPANY
GEDNEY
AMERICAS BLDG. • RADIO CITY • NEW YORK 20
Foundry, Factory and Shipping Point: Terryville, Conn.

For more facts circle 638 on Reply Card

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JULY, 1960
This card good only until October 31, 1960

PLANT ENGINEERING

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Your Name..... Your Title.....

Your Company Name.....

Company Address..... City..... State.....

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BULLETINS

101	102	103	104	105	106	107	108	109	
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Use this space to ask for tear sheets, other information wanted. .....

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BULLETINS

(Begins on page 25)

TOOLS, MACHINE SHOP

Tool Buyers' Guide—Catalog 60, complete with specifications and prices, is a 68-pp ordering book on Double Circle tools. Covers drills, reamers, end mills, countersinks, carbides, counterbores, others. Well indexed and illustrated, catalog also provides information on features and applications; includes section on drill facts. Chicago Latrobe.
▲ For a copy, circle 142 on Post Card

Fastening System—Technical data and illustrations are contained in 18-pp file of Bulletins B-141, B-118, B-130 with information on working loads, fasteners and accessories. Separate sections are devoted to applications, drive pins, internally threaded studs and couplings and guards. Data on Shure-Set (a hammer-in fastening tool) provided. Ramset Div., Olin Mathieson Chemical Corp.
▲ For a copy, circle 143 on Post Card

How to Bend Conduit—Illustrated Bulletin 260, on bending conduit or pipe easily and accurately, features an improved bender. Subjects covered include, calculating lengths of legs, locating bend, back-to-back method, back-to-back push-through method, others. Lidseen of North Carolina.
▲ For a copy, circle 144 on Post Card

SPACE, PROCESS HEATING

Infra-Red for High Bays—Design data, control arrangements and economic advantages of heating high bay buildings with gas fired infra-red heaters are explained in this bulletin. Mounting heights for different models and recomended minimum clearances from combustibles are tabulated. Control arrangements are illustrated. Perfection Div., Hupp Corp.
▲ For a copy, circle 145 on Post Card

Tank Heaters—Sixteen-pp Bulletin TH-160, on Hydro-Flo tank heaters for heating water with steam or water, gives general information on features and operating pressures and operating procedure. Rating tables and dimensional data included. Bell & Gossett Co.
▲ For a copy, circle 146 on Post Card

Heat Transfer Oil—Described in this bulletin is Sun 21, heat-transfer oil for use in closed circulating systems equipped with expansion tanks. High thermal efficiency and stability, easy circulation and other advantages are given, and important properties are listed. Sun Oil Co.
▲ For a copy, circle 147 on Post Card

Why Coil Freeze-Ups—Technical Bulletin T-503 explains why non-freeze air heating coils freeze. This bulletin discusses the factors leading to freeze-ups, provides a chart for determining the freezing point, and offers some practical hook-ups to overcome freezing conditions. Sarco Co., Inc.
▲ For a copy, circle 148 on Post Card

INSULATION

Duct Insulation—Six-pp Brochure IN-285A presents Microlite, a lightweight, blanket-type fiber glass insulation for heating or air conditioning ducts or combination heating-cooling ducts. Shows standard application methods for all type ducts, gives thickness and density data and lists moisture barrier materials available already attached. Includes government specifications and UL fire hazard ratings. Johns-Manville.
▲ For a copy, circle 149 on Post Card

Flexible Pipe Insulation—This bulletin describes Armaflex 22, a flexible foamed plastic insulation for piping. Gives advantages, physical properties, thickness recommendations and sizes. Tells how to apply it to new or existing piping and fittings. Armstrong Cork Co.
▲ For a copy, circle 150 on Post Card

MECHANICAL POWER TRANSMISSION

Variable Speed Drives—Six-pp Folder 2874 describes constant horsepower variable speed drives to meet capacity demands to 50 hp and ratios to 5.5:1. Discusses features of a twin-strand single roll chain that operates between a pair of smooth facing wheels to change ratio and output shaft speed as effective diameter of wheel faces is altered. Bulletin also shows assemblies. Link-Belt Co.
▲ For a copy, circle 151 on Post Card

Worm Gear Reducers—Book 2824, 66 pp, introduces company's fan-cooled worm gear speed reducers in 25 types and over 135 sizes, available in ratios from 5:1 to 3600:1, with torque ratings to 135,000 lb-in., up to 150 hp. Illustrated with application photos, book lists equipment on which reducers have application. Selection data includes rating tables arranged according to speed as compared to ratio, with reducer sizes listed on individual pages for a given rpm. Thermal input and mechanical output torques shown. Link-Belt Co.
▲ For a copy, circle 152 on Post Card

More Compact Drives—Catalog 125 is a 28-pp engineering and specification guide on Hi-Cap Wedge belt drives. Provides step-by-step instructions for drive selection, with tables of service factors, horsepowers; dimensions and weights of 182 stock and 54 made-to-order sheave sizes, with diameters from 2.65 to 71 in.; specifications of QD bushings, bores and keyways; installation and removal instructions. Fort Worth Steel & Machinery Co.
▲ For a copy, circle 153 on Post Card

V-Belts and Hose—Catalog 260, 52 pp, covers company's industrial V-belts, including Cog-Belt and Poly-V and fhp types, as well as sheaves and industrial hose, providing data on sizes, prices. A section on hose covers molded braided, horizontal braided, machine-built wrapped fabric, hand-built wrapped fabric and woven jacket types. Gives recommended hose applications in specific fields. Dayton Industrial Products Co.
▲ For a copy, circle 154 on Post Card

Postage-free Cards for ordering bulletins are on the facing page. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

For Mounting Bearings—Selected engineering drawings for mounting Reali-Slim bearings are presented in 28-pp Bulletin S-112. Low cost, light weight, space saving features are emphasized, specifications and prices for off-the-shelf ball radial type bearings included, as well as engineering drawings of typical installations. The Kaydon Engineering Corp.
▲ For a copy, circle 155 on Post Card

STORAGE

Water Storage Tanks—"Tanks That Advertise," Brochure A-56, describes elevated water storage tanks built as king-size replicas of consumer products. Photos show steel structures which combine efficient water storage and sales promotion. Chicago Bridge & Iron Co.
▲ For a copy, circle 157 on Post Card

Mechanized Bulk Storage—Sixteen-pp Bulletin MU-107 contains specifications on Fermaglas bulk storage structures (glass-fused-to-steel construction) with mechanical sweep-arm bottom unloader which makes possible automatic systems for storing and conveying bulk materials into process. Performance data and typical installations with schematic flow diagrams of systems provided. A. O. Smith Corp.
▲ For a copy, circle 158 on Post Card

Steel Storage Equipment—This 8-pp Catalog DC-60 describes and illustrates angle shelving, T-Line shelving, steel lockers, book case shelving, steel cabinets, wire basket storage units and service truck shelving in phosphatized steel. Specifications covering design and construction are described and pictured, and tables list dimensions. Penco Div., Alan Wood Steel Co.
▲ For a copy, circle 159 on Post Card

MATERIALS HANDLING

Flexible Handling System—Twelve-pp Bulletin 430 is devoted to the Payloader system, adaptable to one specific application or many uses, for full-time handling of one material or many materials, or for part time jobs from one end of a plant to the other. Illustrated case histories cover use of Payloader trucks in a wide range of industries. Specifications are tabulated for two- and four-wheel drive models, gasoline or diesel engine. The Frank G. Hough Co.
▲ For a copy, circle 160 on Post Card

Why Battery Trucks—Purpose of this 20-pp booklet is to present major features of construction and operating characteristics of battery-electric industrial trucks, and to show what users say about their advantages. Operating economy, low main-

BULLETINS

(Begins on page 25)

tenance, safety and other factors are covered. Comments from more than 20 users are provided. Electric Industrial Truck and Allied Products Manufacturers.

▲ For a copy, circle 161 on Post Card

Improved Fork Lifts—How this manufacturer's FT20-24 2000-lb capacity fork lift trucks are designed to outpower, outmaneuver, outclimb, outperform and outlast others is told in text and picture in 8-pp Form BU-485. Also specifications and capacity data on this gasoline engine truck. Allis-Chalmers Mfg. Co.

▲ For a copy, circle 162 on Post Card

Paper Handling Techniques—This package of seven case history bulletins describes paper handling techniques with materials handling equipment. Efficient and economical methods of handling rolls and flat paper during warehousing—in-plant movement, order picking, shipping and receiving operations—are covered in text and action photo. Lewis-Shepard Products, Inc.

▲ For a copy, circle 163 on Post Card

Pneumatic Conveyors—Eight-pp Bulletin ER-G-9 on selection and use of pneumatic conveyors discusses three basic systems, elements of each, component parts, types of conveying lines, valves, indicators, and controls. Also discusses where to use pneumatic systems, their advantages, and relative cost for investment, power, and mechanical maintenance. Photos and diagrams illustrate text. Materials which can be handled pneumatically are listed. Fuller Co.

▲ For a copy, circle 164 on Post Card

Mechanical Vibrating Conveyors—Catalog 954, 64 pp, dicusses operation and features of mechanical vibrating conveyors. Four types to meet a wide range of applications are presented in detail. These include a heavy duty conveyor; a medium-duty, medium-weight conveyor; a low-capacity, low-height unit; and dynamically balanced type for use on upper floors, tops of silos etc. A section is devoted to feeders, dryers, coolers, screens. The Jeffrey Mfg. Co.

▲ For a copy, circle 165 on Post Card

Lightweight Crane Bridge—Bulletin 1B describes the Flexo-Crane, a traveling crane bridge affording easy handling of ½- and 1-ton loads. Gives construction features and specifications for the lightweight Flexo-Crane and illustrates an installation. Abell-Howe Co.

▲ For a copy, circle 166 on Post Card

Specs for Chain Hoists—Industry specifications for manually lever operated chain hoists are given in this 6-pp booklet. Contains tables and recommended minimum standards on lever operated type hoists of ratchet and pawl design and load brake design using roller or link coil chain. Hoist Manufacturers Ass'n.

▲ For a copy, circle 167 on Post Card

PLASTICS, SYNTHETICS

How to Use Teflon—This 8-pp bulletin tells how to use Teflon in sheets, rods, tubes, other shapes. Describes Teflon's chemical, physical, thermal, and electrical properties; tells how to check quality. Fabricating techniques are discussed, with recommendations on tools and cutting speeds. Tells how to stamp and form Teflon. Suggested applications and illustrations in 10 general fields are listed. Cadillac Plastic & Chemical Co.

▲ For a copy, circle 168 on Post Card

Penton Buyers' Guide—This 22-pp booklet lists manufacturers of chemical processing equipment made with Penton, an engineering thermoplastic for corrosion control. These are included under nine classifications: coatings, fabricated machined parts, pipe and fittings, pumps, sheet and stock shapes, tank liners, tubing, valves. Cellulose Products Dept. Hercules Powder Co.

▲ For a copy, circle 169 on Post Card

Guide to Silicones—This 12-pp engineering guide explains how various physical forms of silicones contribute to reliability, miniaturization, modularization and environmental protection, increase serviceability over wide extremes of temperature. Contains engineering data and processing information on silicones; details electrical and mechanical properties; describes typical applications. Dow Corning Corp.

▲ For a copy, circle 170 on Post Card

MAINTENANCE OF BUILDINGS AND GROUNDS

Aluminum Paints in Color—Protective and decorative advantages of painting with aluminum in color are discussed in Form 30-11451. Illustrated in full color, shows examples of use of this metal-bright paint on industrial structures suggests other uses. Tells how to apply the paint, how much to use. Aluminum Co. of America.

▲ For a copy, circle 171 on Post Card

Roofing Guide—This Manual 1136, 16 pp, describes and illustrates 14 common roof problems and recommends repairs and maintenance to overcome each. Covers flashing damage, alligatored, blistered, torn and open seams. Various roof types are discussed, and products for complete roof protection are listed for each type roof. The Monroe Co., Inc.

▲ For a copy, circle 172 on Post Card

Underground Sprinklers—Catalog 603C, gives operating data, specifications and suggestions for use of 16 underground sprinkler heads and accessories. Patterns and sizes are described. Contains coverage, discharge and pressure tables. Number of heads operative per valve at full performance for various pipe sizes is listed. Rain Jet Corp.

▲ For a copy, circle 173 on Post Card

Parking Lot Planning—Forty-pp "How to Lay Out a Parking Lot" is illustrated with engineering drawings, photos and charts of various types to aid plant engineers in layout of lots to handle more cars more efficiently. Includes suggested layouts for 45-, 60- and 90-angle parking with recommended stall widths and lengths, aisle widths, entrance and exit dimensions. Also describes parking equipment, including automatic gates, barriers, guides and sonic detectors. Western Industries, Inc.

▲ For a copy, circle 174 on Post Card

Resins on the Turnpike—Successful use of Emeri-Epox, an epoxy resin patching compound in solving serious surfacing problems on the New Jersey Turnpike is detailed in this illustrated report. Provides labor and material cost data, and includes photos showing application procedures. Walter Maguire Co., Inc.

▲ For a copy, circle 175 on Post Card

Rubber Bumpers—Bulletin H-24 describes rubber bumpers for absorbing impact and pictures their use in loading platform protection, dock fendering, truck-tail gate fendering, parking lot guides. Discusses cylindrical and rectangular shapes available, giving specific advantages, engineering data. Hewitt-Robins Inc.

▲ For a copy, circle 176 on Post Card

Aluminum Scaffolding—Eight-pp Bulletin AS-10, illustrated with on-the-job photos, contains details on 29-in. and 4-ft 6-in. wide ladder scaffolds, sectional scaffolds and folding-type scaffolds; work stands and one-man cage. The Patent Scaffolding Co.

▲ For a copy, circle 177 on Post Card

OTHER EQUIPMENT

Perforated Metal—Engineering data for specification of heavy-gage perforated metal is outlined in 40-pp Brochure 8159. Covers application as screens, strainers, dryers, separators, supports, guards, ventilators and drains, etc. Data includes directions for pattern specification, dimensions, unit weights, calculation of open area, materials selection, fastening methods, and equivalence tables relating wire cloth to square, round and Hexscreen patterns. Cross Perforated Metals, National-Standard Co.

▲ For a copy, circle 178 on Post Card

For Sludge Collection—Sludge collectors for normal and heavy-duty application are cataloged in Bulletin 6751. Provides drawings of typical layouts for primary and final settling tanks. Technical specifications are detailed. Also covered are modifications required to convert these units into cross collectors for multiple tanks, and to mechanical skimmers. Yeomans Bros. Co.

▲ For a copy, circle 179 on Post Card

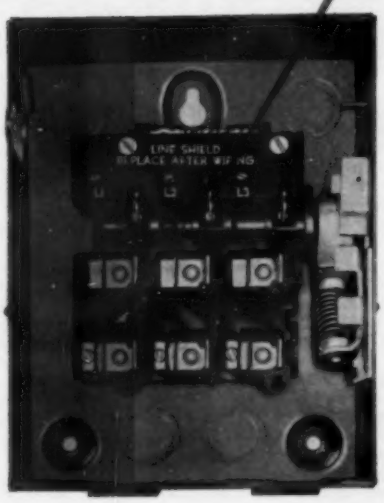
High Alloy Castings—This technical publications list covers papers, articles, reprints and data sheets on stainless and heat resistant castings, covering alloy selection, applications, research (corrosion and high temperature), engineering data, fabrication, foundry practice, metallurgical structure, properties, testing methods, and such general topics as purchasing of castings. Alloy Casting Institute.

▲ For a copy, circle 180 on Post Card

For extra safety...

GET THE SWITCH WITH THE RED HANDLE!

You can see the contacts— Silverplated blades are plainly visible, spring reinforced for full, firm electrical contact.



No wire abrasion
Side wiring gutter is unobstructed—free of moving parts which can chafe and wear wire insulation.

These features mean extra safety for you: Vivid red handle is insulated, provides ON-OFF identification from over 100 feet away; safety phase barrier protects against accidental contact with live parts; no fiber linkages in mechanism to deteriorate with age, moisture or heat; complete locking provision; mechanical interlock and line shield (Heavy Duty). Heavy Duty (Type A) sell at Normal Duty (Type C) price levels. Write for Bulletin CPD-74. See your G-E distributor for a demonstration.

GENERAL ELECTRIC

Circuit Protective Devices Dept., Plainville, Conn.

For more facts circle 639 on Reply Card

BULLETINS

(Begins on page 25)

Adhesives and Coatings—This product bulletin describes company's complete line of adhesives, coatings and weatherproofings for the industrial and commercial insulation field. Offers simplified selection method and lists typical applications. Insul-Coustic Corp.

▲ For a copy, circle 181 on Post Card

Double-Flow Aquatower—Bulletin DFA15-60 describes company's double-flow Aquatower designed to bridge the gap between standard double-flow Aquatowers and unlimited capacity industrial cooling towers. Specifications and engineering data included. The Marley Co.

▲ For a copy, circle 182 on Post Card

Markers, Signs—Illustrated in full color, this 24-pp catalog provides information on pipe and electrical markers, numerals, letters, safety and identification signs, all available from stock. Explains how markers are applied, includes prices and ordering information. North Shore Nameplate, Div., Anodyne, Inc.

▲ For a copy, circle 183 on Post Card

Industrial Cleaners—This 8-pp brochure gives features and application suggestions for industrial cleaning compounds and solvents. Includes steam charge and steam cleaning compounds, degreasing concentrates, rust and scale solvents, aluminum cleaners, solvent degreasers, cold cleaners, carbon removers, and paint strippers. Brulin & Co., Inc.

▲ For a copy, circle 184 on Post Card

Vibration Control Specs—Bulletin F2D, is a 6-pp guide to writing vibration and noise control specifications for air conditioning and related equipment. Discusses factors involved in selecting resilient mountings, with attention to effects of existing job conditions. Photos show type of mounting to use for each problem. The Korfund Co., Inc.

▲ For a copy, circle 185 on Post Card

Molded Packing—Engineering Bulletin K-260 presents technical information on Palmetto Kups, single lip piston seals for hydraulic or pneumatic applications where there is reciprocating motion. Provides specifications and application data, gives recommended uses. A table lists fabric and synthetic composition Kups. Greene, Tweed & Co.

▲ For a copy, circle 186 on Post Card

Force Feed Lubricators—Catalog L-60 44-pp. illustrates and describes force feed lubricators. Gives information on principles of force feed lubrication, engineering data on viscosities of lubricants, and specific, detailed operating instructions for each type of lubricator. An easy-to-read chart compares various models with reference to pumping unit characteristic, priming methods, drive types and locations, and lubricants available. Manzel.

▲ For a copy, circle 187 on Post Card

Industrial Hose—This 30-pp industrial hose catalog details manufacturing facilities and types of industrial hose available. Air, water, polypurpose, welding, paint spray, booster and other types are described, with pertinent information on applications, cover, reinforcement, tube, lengths, packaging and recommended couplings. Hose couplings are also covered. Swan Rubber Co.

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For Difficult Dust Collecting—Described in 6-pp Bulletin 1928 is Series 345 dust collector line. Bulletin outlines advantages of large tubes for high efficiencies and resistance to plugging, utilizing a cutaway to illustrate operating characteristics. Easily-used nomograms are provided for collector selection and efficiency determination. Industrial Div., American-Standard.

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High Velocity Dryers—Bulletin HV-501 gives technical data on dryers with velocities ranging from 15,000 to 20,000 fpm and temperatures to 800 F and beyond. Three models are described. J. O. Ross Engineering, Div. Midland-Ross Corp.

▲ For a copy, circle 191 on Post Card

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 245 and 246.

CONSTRUCTION

Open Web Joists—Standard and long span open web steel joists are illustrated and described in this 38-pp catalog. Advantages of the steel joist construction are detailed, and sections are included on design calculation, properties and dimensions. United States Steel Corp.

▲ For a copy, circle 301 on Post Card

Aluminum in Colors—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Aluminum Co. of America.

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For Roof, Wall Construction—Included in this literature file are product bulletins describing roof and wall construction materials. Bulletin 59C covers corrugated sheet; 59W, insulated walls and metal panels; 595, insulated sandwich curtain walls and roofs; Bulletin 60D, steel and aluminum roof deck; Bulletin 60F, high-strength permanent steel forms for concrete roof and floor slabs; and Bulletin 60R, conveyor hoods and curved corrugated sheets. Elwin G. Smith & Co., Inc.

▲ For a copy, circle 303 on Post Card

Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

▲ For a copy, circle 304 on Post Card

Fir Plywood—This 34-pp construction guide contains full-page structural drawings providing basic information on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Assn.

▲ For a copy, circle 305 on Post Card

Reglazing Panels—Described in this product sheet is a translucent fiber glass panel designed for replacement of shattered and fractured panes of wire glass in top hinged continuous operated and fixed steel sash. Butler Mfg. Co.

▲ For a copy, circle 306 on Post Card

Acrylic Plastic Sheet—This 12-pp Booklet PL-415 describes properties and characteristics of Plexiglas acrylic plastic sheet. Applications in a variety of industries are illustrated, and advantages detailed. Rohm & Haas Co.

▲ For a copy, circle 307 on Post Card

Industrial Doors—Features and advantages of company's automatic industrial doors illustrated and described in 8-pp Catalog 159. Dimensional drawings and photos show details of design. Clark Door Co., Inc.

▲ For a copy, circle 309 on Post Card

Floor Surfacing—Described in this product bulletin is a copolymerized floor surfacing claiming superior tensile, flexural, bond and compressive strength. Detailed specifications and photos of applications are included. The Master Mechanics Co.

▲ For a copy, circle 310 on Post Card

Corrosion-Proof Flooring—Bulletin 120-A describes a monolithic corrosion-proof flooring material developed for application over concrete to protect against acids, alkalis and solvents. The Ceilcote Co., Inc.

▲ For a copy, circle 311 on Post Card

Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8-pp. Discusses safety features. Alan Wood Steel Co.

▲ For a copy, circle 312 on Post Card

Safety Grating—Steel, aluminum and stainless steel safety grating for a variety of industrial applications is featured in illustrated 24-pp Catalog 5911. Shows typical installations, and includes complete engineering data for erection, as well as load charts. The Globe Co.

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Two parallel stainless steel Wissco Belts convey and press mineral fiber slurry in the manufacture of famous Celotex Mineral Fiber Board. Belts last an average of 1,500,000 feet of production runs, ten times the total of Fourdrinier wires they replaced.

This is the image of CF&I. He stands for many engineered steel products, such as Wissco Woven Wire Processing Belts.

FAMOUS NAMES *ride on* WISSCO BELTS...

Celotex Corporation

"Wissco Belts last ten times longer than the square mesh Fourdrinier wires they replaced. By switching to Wissco stainless steel belts we extended belt operating time tenfold, stopped belt slippage, improved product quality and eliminated downtime caused by belt failure — with the resultant saving of at least $10,000 annually."

These are the words of Mr. R. L. Cochran, Production Supervisor of Celotex Corporation's Lagro, Indiana plant. He continues: "Two Wissco Belts are at work in each of our Fourdrinier machines. The bottom belt conveys the mineral fiber slurry while a second belt, just above it, presses the material to the proper thickness. The belt's open mesh permits easy liquid drainage. Loosening of the material isn't a problem because the belt stretches very little no matter how taut it becomes. And we don't have to worry about torn belt edges. Our Wissco Belts have *never* gotten out of alignment."

Celotex Corporation adopted Wissco Belts in 1949 after consulting with Wissco engineers. Mr. Cochran states the results of installing Wissco Belts: "The mineral fiber slurry in our operation is highly corrosive. With our old copper and brass belts, costly breakdowns, product damage and high maintenance costs were frequent occurrences. As soon as we switched to corrosion-resistant, stainless steel Wissco Belts, all this trouble disappeared."

Wissco Belts are also available in carbon and special alloy steel, depending on individual conditions of corrosion, temperature and abrasion.

Put Wissco Belts to work on your process-conveying operations. For design and installation information on Wissco Belts, call the CF&I sales office nearest you.

WISSCO BELTS

THE COLORADO FUEL AND IRON CORPORATION

CF&I STEEL

In the West: **THE COLORADO FUEL AND IRON CORPORATION**
Denver and Oakland

In the East: **WICKWIRE SPENCER STEEL DIVISION** — Atlanta · Boston Buffalo · Chicago · Detroit · New Orleans · New York · Philadelphia

For more facts circle 640 on Reply Card

7249

DATA FILE

(Begins on page 250)

Grating and Treads—Safety, visibility, permanence and easy maintenance are among advantages of open flooring discussed in 28-pp Bulletin 2527-R. Covers use of electro-forged grating in a wide range of industries also features grating applications. Information provided includes types and spacing, bearing bar surfaces and weights, fastening methods, and safe loads. Blaw-Knox Co.

For a copy, circle 314 on Post Card

SLINGS, CHAINS WIRE ROPE AND FITTINGS

Sling Chain Handbook—Illustrated Data Book 100, 32-pp, presents "how to do it" information on sling chains—from ordering to care, use and inspection. Contains diagrams, charts and tables on standard and special styles of the sling chains. Columbus McKinnon Chain Corp.

For a copy, circle 315 on Post Card

Sling Handbook—Form SL-3 is an illustrated 40-pp refrence book covering more than 80 subjects on slings and fittings. Included in this revised edition is refrence information condensed into handy chart form on sling types, dimensions and rated loads. Union Wire Rope Corp.

For a copy, circle 316 on Post Card

Slings For Industry—Bulletins 5886 and 5308-R describe Safe-Guard cable-laid slings, designed for applications where a soft sling body is required and where flexibility is more important than resistance to abrasion; and rope-laid slings for applications where abrasion resistance is a must. Macwhyte Wire Rope Co.

For a copy, circle 317 on Post Card

MECHANICAL POWER TRANSMISSION

Controlled Speed Systems—Illustrated with schematic drawings and application photos, this 8-pp bulletin explains company's controlled speed system principle which provides adjustable speeds by converting fixed-speed a-c motors to adjustable speeds on existing or new equipment. U. S. Electrical Motors Inc.

For a copy, circle 320 on Post Card

Magnetic Drives—Performance data on magnetic drives designed to provide overload protection even under extended full stall are presented in 12-pp Bulletin TP 1-60. Drive features are described, typical application illustrated, and engineering selection detailed. Tormag Products, Div., Gleason Reel Corp.

For a copy, circle 321 on Post Card

Helical Gear Drives—Featured in 16-pp Book 2651 is a line of helical gear drives combining a high degree of standardization with ability to stand up in heavy duty service. Construction features and performance details are covered, selection data included, with load classes, service factors, torque ratings. Link Belt Co.

For a copy, circle 322 on Post Card

Flange Mounted Drives—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

For a copy, circle 323 on Post Card

Fluid Drive—Eight-pp Bulletin 9819 describes and illustrates adjustable speed Gyrol fluid drives, 1- through 25-hp, giving advantages and applications. Components and operation covered. Industrial Div., American-Standard.

For a copy, circle 324 on Post Card

Motorized Gear Drive—Bulletin 2350 describes Line-A-Spede motorized gear drives which are gear reducers powered by standard NEMA frame motors mounted on a shelf attached to the reducer. Illustrates construction features through cutaway view. The Louis Allis Co.

For a copy, circle 325 on Post Card

Multiple V-Belt Drives—Catalog HD-901, 24 pp, lists advantages and features of the HC V-belt drive designed to reduce drive costs and take up 50 per cent less space. Ratings, installation information and drive selection tables are provided. Stock sheaves and bushings are also described. The Gates Rubber Co.

For a copy, circle 326 on Post Card

Anti-Friction Bearings—Catalog 424-B covering "the broadest line in the anti-friction field," is an 8-pp folder giving capsule presentation of company's entire product line. A brief description of each product is provided. SKF Industries, Inc.

For a copy, circle 328 on Post Card

Spring Clutches—Described in this 30-pp catalog are five standard lines of spring clutches in bore sizes from ⅛ to 1 in., torque capacity to 1250 lb-in., for use in applications utilizing drive up to 5 hp. Clutches offered include over-running and back-stopping; indexing; on-off; on-off indexing; and safety lock control. Marquette Div., Curtiss-Wright Corp.

For a copy, circle 329 on Post Card

INSTRUMENTS, CONTROLS

Automatic Controls—Selection and application information on a line of automatic controls for steam and water service is presented in this 46-pp Engineer's Manual. Covers controls for fuel oil heaters, heat exchangers for cooling, instantaneous heat exchangers, jacket water cooling, process hot water, pressure reducing. The Powers Regulator Co.

For a copy, circle 330 on Post Card

For Limited Panel Space—Bulletin 532 describes Model 216 indicator used with company's automatic tank contents gage. Bulletin contains a full illustration of indicator which, although occupying a small space, has a 20-in. scale. The Liquidometer Co.

For a copy, circle 331 on Post Card

MAINTENANCE

Metal Surface Treatment—This 40-pp catalog on metal surface processing (cleaning, washing, rinsing, drying, and spraying flow and dip coating) illustrates and describes drum-type machines, conveyor machines and systems, combination drum and conveyor machines, monorail machines, finishing systems. Ransohoff Co.

For a copy, circle 334 on Post Card

Zinc Coating—Described in this bulletin are properties and advantages of Dimetcote 3, an inorganic zinc coating which "cold galvanizes" any steel surface. Typical applications are illustrated and properties listed. Amercoat Corp.

For a copy, circle 335 on Post Card

Metal Treatment—Featured in this product bulletin is a metal treatment designed to be applied directly on rusted metal to stop rust action and provide a sound base for maintenance paint. Rusticide Products Co.

For a copy, circle 336 on Post Card

Floor Maintenance —Many types of industrial floors are studied and their soil removal problem analyzed in this 8-pp booklet, complete with charts, list of cleaning compounds, and descriptions of cleaning methods. Methods of sanitizing, stripping wax and paint, and of absorbing liquids told. Oakite Products, Inc.

For a copy, circle 338 on Post Card

Vacuum Cleaners—Bulletin 34, 8 pp, describes heavy-duty vacuum cleaners for industrial, commercial and other uses. Specifications, construction features, and illustrations are included. A furnace cleaner and attachments are also covered. The Black & Decker Mfg. Co.

For a copy, circle 340 on Post Card

Pyramid Ladders—Catalog 158, 20-pp, describes a line of pyramid-design step ladders, as well as hydraulic lifts and fixed or adjustable-level work platforms for above-floor working safety. Illustrates 35 new models of ladders for working heights up to 15 ft. Ballymore Co.

For a copy, circle 342 on Post Card

LUBRICANTS, LUBRICATION

Organized Lubrication—Benefits of organized lubrication—major cost control factors are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority are covered. Texaco, Inc.

For a copy, circle 343 on Post Card

Lithium Base Grease—Featured in this 12-pp booklet is a multi-purpose lithium base grease designed to do the work of many. Characteristics of the grease under different types of industrial conditions are described. Gulf Oil Corp.

For a copy, circle 344 on Post Card

Product Guide—This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel

Look for the label that assures

WEATHER-RESISTANCE

This label stands for *unmatched weatherability* among glass-fiber reinforced panels, because it signifies that the panel is made with PARAPLEX P-444 acrylic-polyester resin. Years of Rohm & Haas research on many types of resins for reinforced panels have established that the best weather resistance is achieved by a combination of acrylic and polyester resins. PARAPLEX P-444 represents the most effective combination for imparting outdoor durability, *plus* pleasing appearance, high strength, excellent light transmission, and easy installation. Only Rohm & Haas supplies this proper combination, in PARAPLEX P-444. We will be glad to send you the names of panel manufacturers.

Chemicals for Industry

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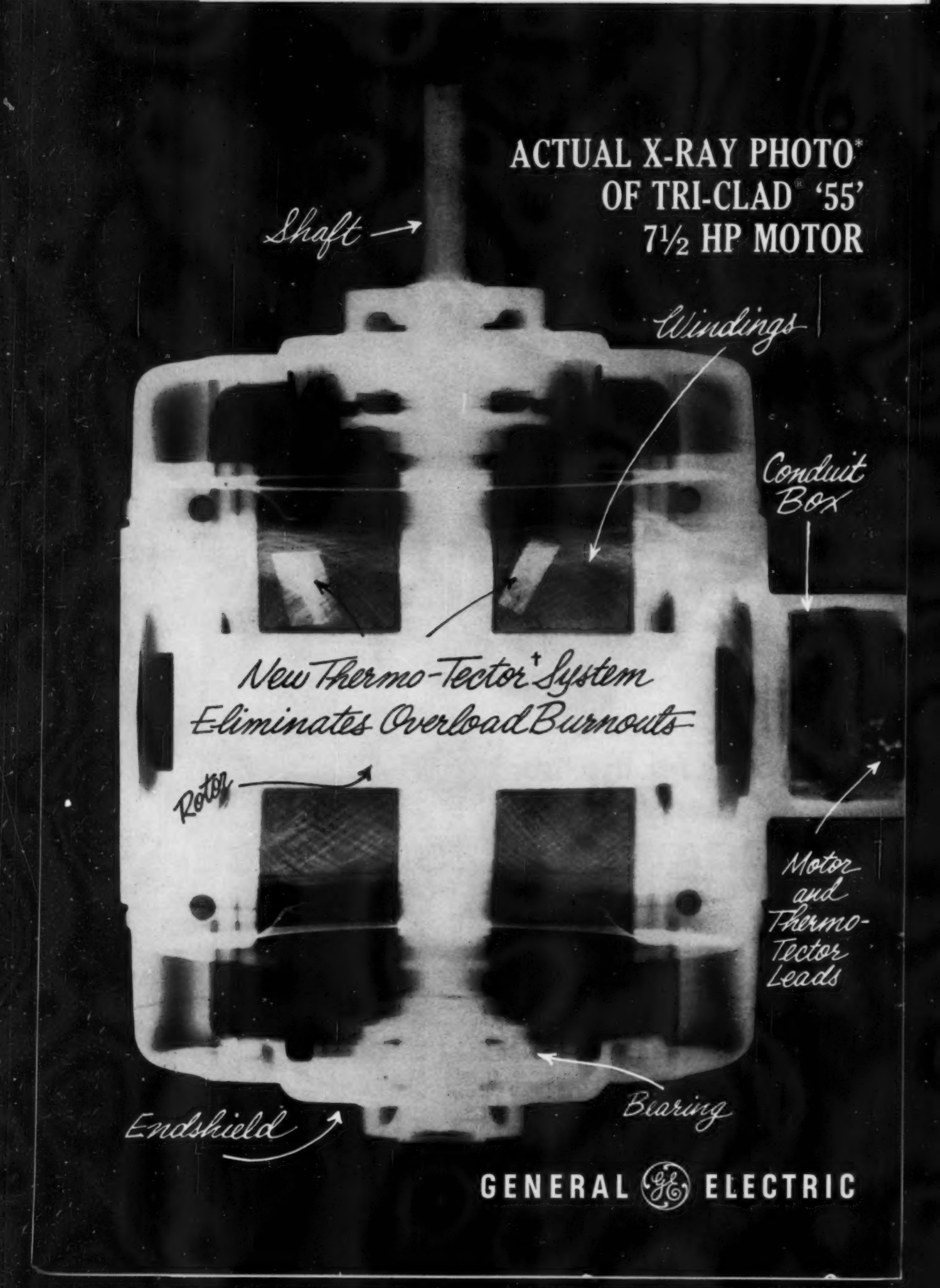
ACTUAL X-RAY PHOTO* OF TRI-CLAD® '55' 7½ HP MOTOR
Shaft
Windings
Conduit Box
New Thermo-Tector† System Eliminates Overload Burnouts
Rotor
Motor and Thermo-Tector Leads
Endshield
Bearing
GENERAL ELECTRIC

Exclusive General Electric Thermo-Tector† System Eliminates Overload Burnouts

ALLOWS MAXIMUM MOTOR OUTPUT— SAFELY!

Now—Tri-Clad '55' motors have simple, direct-acting thermal protectors that positively prevent overload failures!

New Thermo-Tector heat-sensing switches buried in motor windings react *instantly* to prevent heat damage. Unique Thermo-Tector "anticipation" feature varies motor shutoff point according to rate of winding heat rise. This ends need for operating safety margin, allows you to get *full output* from Tri-Clad '55' motors.

Thermo-Tector system requires *no costly amplifying relays*—works with any conventional G-E motor controller. Thermo-Tector protection is available on *all* Tri-Clad '55' motors in frames 254U-445U.

For more information, contact your General Electric Apparatus Sales Office or write for Bulletin GEA-7092, Section 866-01, Schenectady 5, New York.

*Photo made from radiograph taken with 1,000,000-volt G-E Resotron® X-ray machine at General Electric's Large Steam Turbine-Generator Department.

†Trade-mark of General Electric Company.

SMALL AC MOTOR & GENERATOR DEPT.

GENERAL ELECTRIC

SCHENECTADY 5, NEW YORK

DATA FILE

(Begins on page 250)

lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, others. Sun Oil Co.

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VALVES, TRAPS, PIPING

Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive chemicals and atmospheres detailed. Jenkins Bros.

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Choosing the Right Valve—Importance of choosing the right valve is stressed in this 20-pp Bulletin AD-2016. Describes three principal valve types—gate, globe and check valves—their design and service characteristics, lists names of valve parts, describes disc-stem connection, bonnet and bonnet-joint characteristics, materials. Crane Co.

▲ For a copy, circle 348 on Post Card

Valves, Traps, Strainers—Bulletin SS-140-D describes and gives pertinent information concerning float, thermostatic and hydro-flex in-line steam traps, pressure reducing valves, and screwed semi-steel, flanged semi-steel, bronze, ductile iron, cast steel line and block steel angle strainers. Strong, Carlisle & Hammond.

▲ For a copy, circle 350 on Post Card

Steam Trap—Bulletin 257 describes features and operation of a steam trap which uses the kinetic energy of steam to close the valve. Operation details are illustrated and capacities tabulated. Sarco Co., Inc.

▲ For a copy, circle 351 on Post Card

On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. steel and semi-steel, and in helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation. Armstrong Machine Works.

▲ For a copy, circle 352 on Post Card

Plastic Piping Equipment—Engineering of plastic piping systems equipment for corrosion service, including chemical resistance and physical properties charts with recommendations are discussed in this 16-pp Handbook 1159. What materials to specify, materials description, valves with dimensions, fittings, engineering data and a lubricant and sealer, are detailed. Chemtrol Co.

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PVC Pipe, Fittings—This 12-pp bulletin contains latest technical information on polyvinyl chloride pipe and fittings, including advantages and properties, general characteristics and applications, physical flow rate charts and complete specifications. Also included is a chemical resistance chart. Mueller Brass Co.

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UPVC Pipe, Fittings—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP-119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, or normal and high-impact material. Tube Turns Plastics, Inc.

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Tube Fittings—A wealth of technical data on Hi-Seal butt-joint tube fittings for high pressure and temperature applications is presented in 48-pp Catalog 3108. There are sections on pressure, temperature, vacuum, corrosion resistance, port seals, flow and velocity characteristics. The Imperial Brass Mfg. Co.

▲ For a copy, circle 356 on Post Card

Teflon Hose Assembly—Advantages of company's Springfield 120 Teflon hose assembly are detailed in this illustrated bulletin. Assembly procedure is pictured and described and design specifications tabulated. Titeflex, Inc.

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Fluid Line Coupling—Catalog 100 contains data sheets describing company's line of quick-connective fluid-line couplings for pneumatic, hydraulic, oxygen, acetylene, steam, various gases and liquids service. Dimensions included. The Hansen Mfg. Co.

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Swivel Joint—Features and advantages of company's swivel joint which permits fast, easy packing interchangeability are illustrated and described in Bulletin 1258A. Table of specifications and properties are included. Chiksan Co.

▲ For a copy, circle 359 on Post Card

Tube Fittings and Hose—Comprehensive data on brass and steel tube fittings, tube working tools, hose, hose ends and assemblies most frequently used in hydraulic and pneumatic systems is presented in 16-pp Catalog C-301. The Weatherhead Co.

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Stainless Steel Fittings—Light-wall stainless steel fittings and flanges for non-critical process piping are described in this 6-pp bulletin. Illustrations show methods of joining light-wall fittings and pipe, including a sequence of photos on making "rolled in" flanged assemblies. Tube Turns, Div., Chemetron Corp.

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HEATERS, HEATING

Direct Fired Heaters—Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views included. Reznor Mfg. Co.

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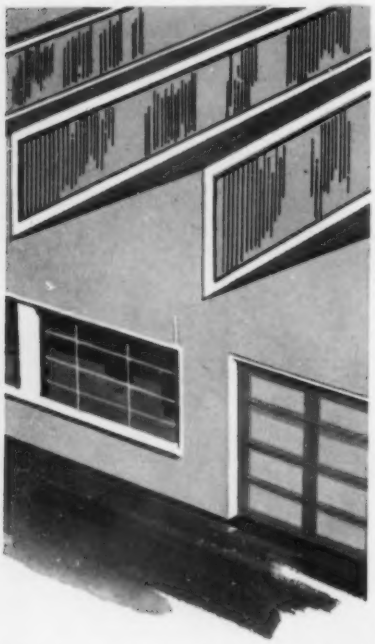
Unit Heaters—Gas-fired blower unit heaters are described and dimensions given in Bulletin GB-660, 6-pp. Mounting height, heat throw data

← For more facts circle 642 on Reply Card



More "light years" per dollar with

Stylux BY BUTLER

You get more maintenance-free years of natural light in your plant when you modernize with Butler Stylux—the superior, shatterproof, translucent plastic panels for glazing.

There's a big difference in plastic panels, and the key to the superiority of Stylux is its exceptional quality. Stylux is an acrylic-fortified plastic panel . . . made from an outstandingly durable resin that protects against sun fade and weather erosion. You get more years of greater light transmission for every dollar you invest.

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Stylux BY BUTLER

Plastics Department,
Buildings Division
BUTLER
MANUFACTURING
COMPANY
Dept. 113, 7400 East 13th Street
Kansas City 26, Missouri

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DATA FILE

(Begins on page 250)

and specifications are included. Modine Mfg. Co.

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Space Heaters—Counterflo heaters, designed to deliver maximum Btu output to air at the point of use, are described and illustrated in Bulletin 580, 6 pp. Engineering data and specifications are included. Dravo Corp.

▲ For a copy, circle 364 on Post Card

Instant Hot Water—Described in this product bulletin is a heater package designed to give accurately controlled hot water under varying loads. Table of heating capacities is included. Fulton Sylphon Div., Robertshaw-Fulton Controls Co.

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METALS

Nickel-Chromium Alloy—Detailed information is contained in Technical Bulletin T-38, 36-pp, on Inconel X, an age-hardenable nickel-chromium alloy. Physical and mechanical properties, applications, specifications, available forms, and design data are given with graphs. Huntington Alloy Products Div., The International Nickel Co., Inc.

▲ For a copy, circle 366 on Post Card

Aluminum and Steel Data—Comprehensive selection data on aluminum and steel available in stock for almost every application is presented in this 242-pp buying guide. Necessary weights, dimensions and descriptive data are tabulated. Individual sections cover structural shapes, construction products, plates, sheets, hot rolled bars, cold finish bars, tubing. Joseph T. Ryerson & Son Inc.

▲ For a copy, circle 367 on Post Card

Galvanized Steel Sheet—Characteristics and advantages of galvanized steel sheet and its products and applications are detailed in this 16-pp Bulletin WC-255. Applications in air conditioning and heating ductwork and its resistance to atmospheric corrosion covered. Wheeling Corrugating Co.

▲ For a copy, circle 368 on Post Card

TOOLS AND WELDING

Power Tools—Comprehensive information on power tools for industrial production, plant maintenance, construction, wood and metal-working is presented in the 58-pp edition of their 1959 product guide. Specification and applications data on power saws and saw blades, sanders, grinders, brushes, drills, files, grinding wheels, screwdrivers included. Skil Corp.

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Industrial Tools—Information on a complete line of industrial tools, including 500 new types and sizes never before offered, is presented in 120-pp Catalog 57. Included are complete lines of wrenches, socket wrenches, drop forged clamps, tool holders, set up and hold down tools, cutting tools and pipe tools. Drawings and charts provided. Armstrong Bros. Tool Co.

▲ For a copy, circle 371 on Post Card

Industrial Wrenches, Hand Tools—Tools for production lines, maintenance work and product servicing are presented in 156-pp Industrial Catalog 58-I. Loaded wtih pictures and tool facts, book describes in detail the complete line of over 4,000 tools—including chests and roll-cabs, wrenches and sockets of all types, screwdrivers, pliers, pullers, etc. Snap-on Tools Corp.

▲ For a copy, circle 372 on Post Card

Pipe Tools—Ordering and application information on Rigid pipe tools is provided in 16-pp illustrated Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives. The Ridge Tool Co.

▲ For a copy, circle 373 on Post Card

Powder Actuated System—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, etc. The second booklet indicates the correct fastening and charge to use. Ramset Div., Olin Mathieson Chemical Corp.

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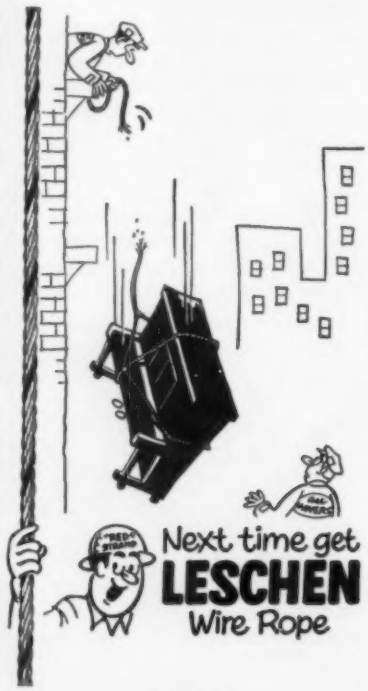
Welding Wires—Submerged arc and inert gas welding wires are featured in Bulletin DH-402-C. Typical applications of various stainless steel, low



LESCHEN WIRE PORTER ROPE DIVISION
H. K. PORTER COMPANY, INC.

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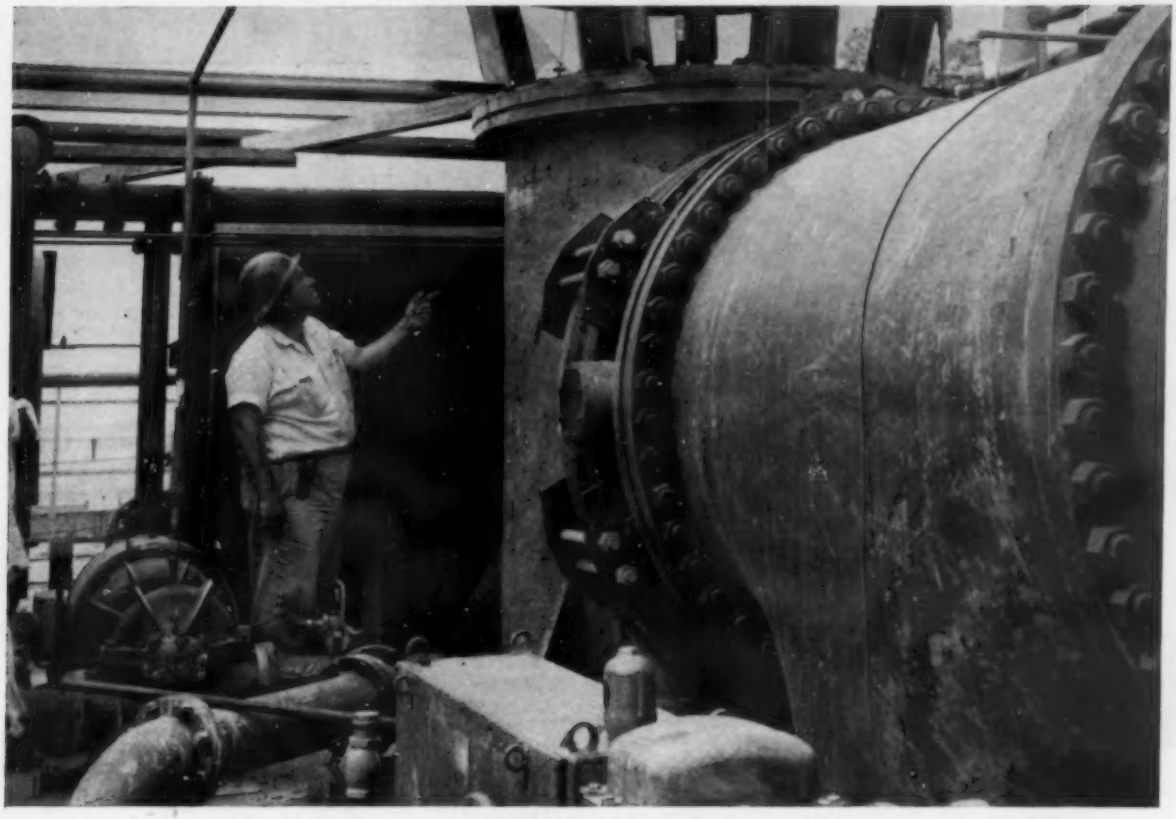

Through this pipe 171 billion gallons of brackish water have passed...

Nickel Cast Iron provides strength, combats corrosion

Every hour of every day for the past three years, this pump has handled 6½ million gallons of water for the cooling and condensing systems of a Virginia power station. The water has a salt range of 11.4 to 27.2 parts per thousand.

Among the steps taken to assure economical equipment performance was the employment of 2% nickel cast iron for the huge pump column, diffuser bell and elbow. The divided water boxes in the condenser are also made of 2% nickel class 40 grey iron.

Nickel improves properties

The nickel cast iron provides improved tensile and compressive strengths over regular grey iron. It helps assure a uniformly dense grain structure, increasing pressure tightness. It also affords greater resistance to graphitic corrosion.

Through the use of Nickel, alone or in combination with other alloying ingredients, the engineering properties of cast iron can be controlled to meet many combinations of service requirements. Would you like complete information? Write us for a copy of "Engineering Properties and Applications of Nickel Cast Iron." A postcard will do it.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street New York 5, N. Y.

TYPICAL ENGINEERING PROPERTIES OF NICKEL CAST IRONS

Class	30	40	50	60
Tensile Strength, p.s.i., min.	30000	40000	50000	60000
Compressive Strength, p.s.i., min.	110000	130000	145000	165000
Torsional Strength, p.s.i., min.	34000	47000	60000	73000
Modulus of Rigidity, p.s.i., typical	$5x10^6$	$5.6x10^6$	$6.2x10^6$	$6.8x10^6$
Impact Strength, Izod AB, ft.lb.*, typical	26	35	43	52
Hardness BHN, typical	200	230	260	290

*The numbering system is similar to that used in A.S.T.M. Spec. A48-48.

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Your best investment in modern air-handling equipment! New Aerovent Air Make-Up Units provide clean, fresh air in winter or summer; help maintain uniform temperature levels throughout working areas. Used as filtered-air supply units or air preheaters, these versatile units permit heating and ventilating systems to operate at design efficiency; equalize negative pressures by replacing exhaust air.

Steam, hot water or gas-fired models in sizes 18" to 54" (larger units available on order) for capacities, pressure conditions and BTU ratings to suit your requirements. Compact, packaged design for roof or wall mounting. Other assemblies also supplied for exclusive use in air supply or air heater applications. Why not investigate the many advantages of these high-efficiency units, today?

STEAM OR HOT WATER

Furnished in 7 unit arrangements in sizes 24" to 54". Capacities from 5,000 to 35,000 CFM. Roof or wall types for all requirements.

GAS-FIRED

Supplied in 4 unit arrangements for roof or wall mounting. Sizes 36" to 54" for various capacities, BTU ratings and pressure conditions.

Write for new Bulletin 880

Air deliveries of all Aerovent equipment are tested and rated in accordance with established and accepted codes and each unit is guaranteed by the manufacturer to deliver its rated performance.

CERTIFIED PERFORMANCE

Aerovent Fans

Aerovent FAN COMPANY, INC.

Ash and Bond Streets — Piqua, Ohio

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DATA FILE

(Begins on page 250)

alloy, and mild carbon steel automatic welding wires are described. Page Steel & Wire Div., American Chain & Cable Co., Inc.

▲ For a copy, circle 375 on Post Card

STORAGE, SHOP EQUIPMENT

Guide to Shelving—To assist plant engineers in selecting proper shelving for all storage requirements. 64-pp Catalog 30 offers detailed suggestions for correct shelving and storing materials, loose and packed parts. Storage cabinets are also described and instructions included for planning of stockrooms. Deluxe Metal Products Co., Royal Metal Mfg. Co.

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Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 245 and 246.

Steel Equipment—Catalog 100 H contains 92-pp of detailed information on steel cabinets, folding chairs, work benches, tool stands, shelving, tool storage, lockers, coat racks, filing cabinets, revolving bins, others. Includes dimensions and specifications. Lyon Metal Products, Inc.

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FANS, VENTILATING AND AIR CONDITIONING

Industrial Fans—Bulletin 690-A, 12-pp, contains dimensions and application and performance data on direct connected fans for general and system ventilation and power roof ventilators, air deliveries to 103,200 cfm. Propellair Div., Robbins & Myers, Inc.

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Induced Draft Fans—Catalog L-3 describes induced draft fans designed for any induced draft application for temperatures up to 800 F. Gives dimensions, capacities, installation data. Fuller Co.

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Propeller Fans—Detailed information on a line of propeller fans and accessories is presented in 20-pp Bulletin A-109E. Dimensional tables, ratings for single, two-propeller and multiblade fans are included. Hartzell Propeller Fan Co.

▲ For a copy, circle 382 on Post Card

Ready Units—Catalog 517 provides 36-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, belt and direct driven units. Dimensions included. Clarage Fan Co.

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Air Engineering—Bulletin E-57 is a 24-pp air engineering data file covering engineering and test facilities for propeller fans, specifications, con-

For more facts circle 648 on Reply Card →

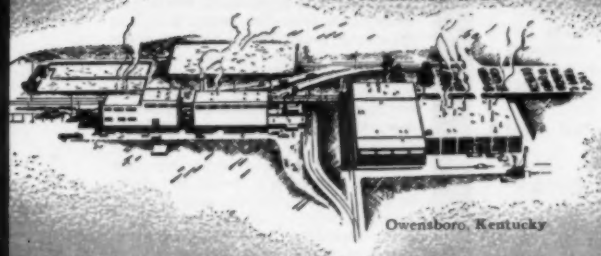
At the OWENSBORO, KENTUCKY PLANT
DEWEY and ALMY CHEMICAL DIVISION/W. R. Grace & Co.

2 Erie City 500 hp.

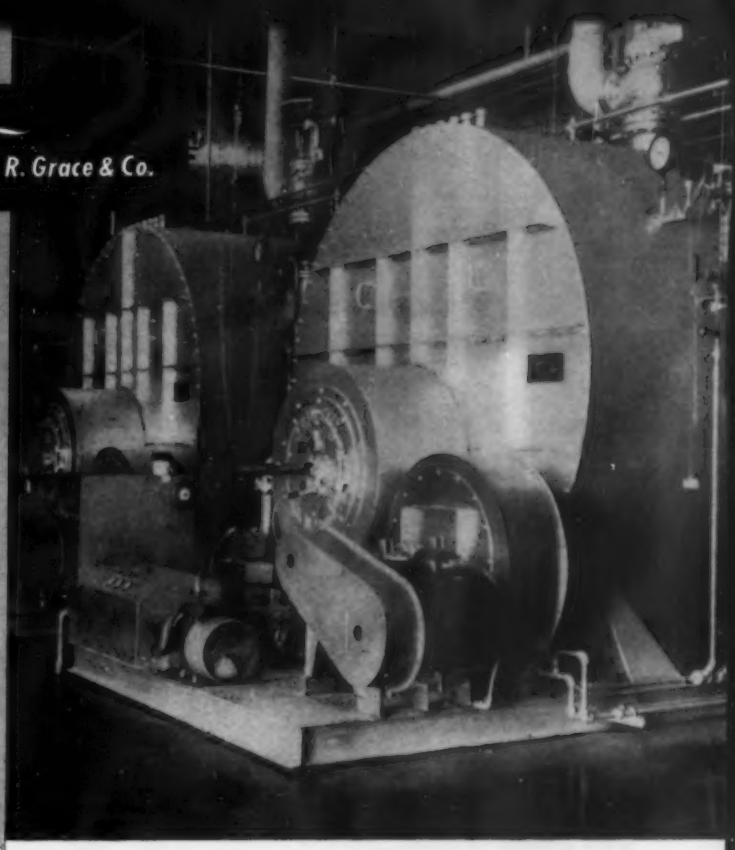
"FT" Package Boilers

"Our plant is equipped with two 500 hp. Erie City "FT" package steam generators gas or oil fired. 150-lb. steam from the generators is used for both building heat and operation of the process. Since the usage of process steam is split between continuous and batch operations, the generating equipment is called upon to operate under wide and rapidly varying load conditions. These Erie City Iron Works package steam generators have met our every requirement."

Harry Marty, *Plant Manager*
DEWEY and ALMY CHEMICAL DIVISION
W. R. GRACE & CO.



Owensboro, Kentucky



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in Process Industries the world over

Callery Chemical Co. Lawrence, Kansas	2—450 hp. "FT's"
Kermac Nuclear Fuels Co. Grants, New Mexico	2—450 hp. "FT's"
Federation Chemicals, Ltd. Trinidad, B. W. I.	2—600 hp. "FT's"
Mettur Chemical & Industrial Corp. Madras, India	2—300 hp. "FT's"
Stauffer Chemical Co. Houston, Texas	1—300 hp. "FT"
National Potash Co. Carlsbad, New Mexico	1—500 hp. "FT"
Chemstrand Corp. Greenwood, S. C.	1—600 hp. "FT"

It pays in many ways to buy the top quality package boiler—Erie City "FT"

This modern plant at Owensboro, Kentucky, is completely automatic and quality control is the key to its success. The completely automatic gas or oil fired 500 hp. "FT's" fit naturally into this most technically advanced operation.

"FT's" are produced by the same skilled craftsmen who manufacture the large, high pressure Erie City steam generators. That's why you will find "FT's" where dependability and availability are a must.

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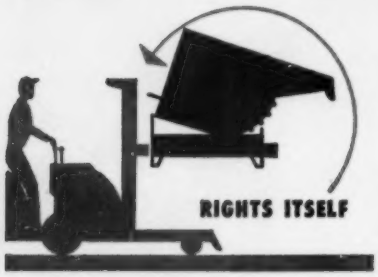
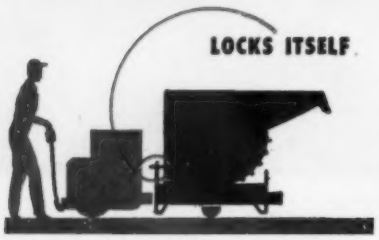
AIR PREHEATERS • • • FIRE and WATER TUBE PACKAGE BOILERS





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A Roura Hopper fits any standard lift truck . . . attached or detached in seconds . . . can't slip off. One man does the entire job. Picks up loaded Hopper with lift truck . . . transports it to destination . . . flips the latch . . . and the Hopper automatically dumps its load, rights itself, locks itself. Cuts costs 50% or more.

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ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 649 on Reply Card

DATA FILE

(Begins on page 250)

struction, maintenance, and installation. Tables for estimating air-handling requirements provided. Aerovent Fan Co., Inc

For a copy, circle 384 on Post Card

Air Conditioning Cabinets—Bulletin AC-121, 28-pp, details and illustrates with photos, drawings and curves, the construction features, unit arrangements, physical data, fan performance, dimensions, and coil ratings of central station air conditioning cabinets. Bulletin covers four general types. Buffalo Forge Co.

For a copy, circle 385 on Post Card

Air Engineering—Heat removal by the air method and heat and moisture control are discussed in 8-pp Bulletin 135 for process and chemical industries. Product, process and flash cooling, vacuum distillation, refrigeration, air liquefaction, process space, low temperature conversion, product drying discussed. Niagara Blower Co.

For a copy, circle 386 on Post Card

SAFETY, SANITATION

Fire-Resistant Fluids—This series of specification sheets describes company's line of fire-resistant fluids including synthetic, oil-water emulsion and glycol types. Physical characteristics and other data given. Mobil Oil Co., Inc.

For a copy, circle 387 on Post Card

Handling Flammable Liquids—Problems involved in the use of flammables in individual processes, and methods and equipment required for safe control are described in this 76-pp safety handbook. Physical properties and characteristics of most commonly used flammables are detailed; recommendations for safe handling given. The Protectoseal Co.

For a copy, circle 388 on Post Card

Fire-Resistant Resin—Structural panels, skylight louvers, chemical ductwork and other products made of Hetron, permanently flame-resistant polyester resin are covered in this illustrated bulletin. Table lists characteristics. Durez Plastics Div., Hooker Electrochemical Co.

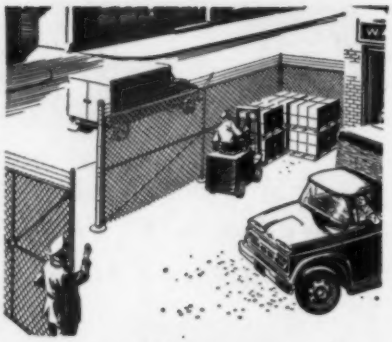
For a copy, circle 389 on Post Card

Fire Alarm Systems—Publication 246 contains 36-pp of detailed information on fire alarm systems for critical applications in industrial, institutional and other public buildings. Contains typical job specifications. The Standard Electric Time Co.

For a copy, circle 390 on Post Card

MATERIALS HANDLING

Hand Traveling Cranes—Bulletin DH-468-B presents cranes, with safety factor of 5 to 1, for industrial applications where accurate spotting of loads is more important than fast travel speeds. These units, company's Type B-9 top running, single bridge, hand traveling cranes, come in 1- to



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These 3 VALUES are important

1. QUALITY is important. When you invest in a fence you want it to last for a long, long time. When you specify PAGE you get 77 years of our experience in the design and manufacture of a quality fence. Page Fence is engineered for long-lasting service and is covered by a Registered Certificate of Quality.

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3. INSTALLATION is important, too. A fence can be no better than the quality of its erection. The Page Fence Member in your locality is trained, experienced, responsible, and interested in your satisfaction.

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When you write us, we'll send you the whole story in a helpful booklet, and the name of our nearest Member. Call him, he will gladly suggest the best answer to your property protection problem.

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Anyone can Claim to Meet the RLM Standards for Uniform Quality

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unbiased proof of conformance can only be had through repetitive tests by an independent laboratory such as is guaranteed by manufacturers offering RLM-LABELED LIGHTING EQUIPMENT

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With RLM-Labeled equipment uniform quality is guaranteed by the manufacturer . . . as well as by the RLM testing and certification program. This program is conducted by the world-famous independent testing organization, The Electrical Testing Laboratories of New York and hence represents the most modern testing program in the lighting industry. Under this program it is not enough that certain samples meet RLM Standards. *Every fixture* to which the manufacturer affixes a RLM Label is warranteed by the manufacturer to meet applicable RLM Specifications.

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Please send free copy of the new "TWIN QQ" Pamphlet, the 1960 RLM SPECIFICATIONS BOOK and names of 22 leading manufacturers offering RLM-Labeled lighting equipment. (Please write name, company and address in margin below.)

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FUEL COSTS DROP 40% with DRAVO COUNTERFLO HEATERS!

The problem . . . after plant expansion, 48,600 square feet of widely varying construction had to be heated efficiently. Some roofs were uninsulated, and large truck doors let in frigid air during winter. The old coal-fired steam heating plant was inadequate; a new heating system was needed. Management compared costs of various heating methods, including probable maintenance expense, and arrived at the following conclusion.

The solution . . . Dravo forced air space heaters. Floor mounted, thermostat controlled Dravo *Counterflo* heaters met requirements for comfort heating. Truck entries were protected by discharge nozzles aimed to provide a protective blanket of warm air. Each area was maintained at the desired temperature level. Drafts were eliminated, and heat loss to roof areas held to a minimum. Heating costs were lowered by 40%, a saving of *$.06 per square foot.*

Bonus benefits . . . include very low maintenance costs. A combination fireman-watchman was no longer needed—additional savings. The elimination of the boiler plant added 600 square feet of usable floor space. The use of Dravo Heaters permitted the installation of an automatic fire and burglar protection system, reducing insurance. Total savings to this company as a direct result of the installation of Dravo Heaters—$5,800 a year.

More information . . . on how Dravo *Counterflo* Heaters can help you lower heating costs? Send the coupon for details on the case history outlined above and full information on economical, high efficiency Dravo Space Heaters.

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Send free bulletins on warm air space heating and the facts on the company mentioned above.

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Company _____

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DATA FILE

(Begins on page 250)

10-ton capacities, spans to 50 ft. Wright Hoist Div., American Chain & Cable Co., Inc.

For a copy, circle 392 on Post Card

Overhead Dispatch System—Form F-192, 8 pp, describes an automatic overhead dispatch system designed to solve a variety of materials handling problems. Outstanding advantages are listed and typical installations are described and illustrated with diagrams. Richards Wilcox Mfg. Co.

For a copy, circle 393 on Post Card

Electric Hoists—Six-pp illustrated Bulletin 905 describes R&M Type J electric wire rope hoists in capacities of ¼, ½, 1 and 2 tons. Shows complete specifications including mounting options and sectionals. Hoist & Crane Div., Robbins & Myers, Inc.

For a copy, circle 394 on Post Card

Link Chain Hoist—Manufacturer's Safety Pull, a link chain hoist with aluminum lever, ratchet and pawl design, is featured in 6-pp Bulletin ADH-86. Capacities, construction and operational data, dimensions and prices given for six models. Coffing Hoist Div., Duff-Norton Co.

For a copy, circle 395 on Post Card

Materials Handling Hose—Presented in Bulletin S-5121 is a line of materials handling hose for industrial applications. These include use in sand blasting, for steel shot blasting, for industrial vacuum cleaners, and for blowing insulation into walls. The Goodyear Tire & Rubber Co.

For a copy, circle 397 on Post Card

Vertical Transportation—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described. Otis Elevator Co.

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Mechanical Jacks—Advantages of company's line of mechanical jacks are detailed in 16-pp Mechanical Catalog 58, including ratchet lowering lever jacks, track jacks, journal and bridge jacks, screw jacks, push-and-pull jacks. Templeton, Kenly and Co.

For a copy, circle 399 on Post Card

Cost-Cutting Materials Handling—"The How Book of Cost-Cutting Materials Handling," is a 24-pp booklet covering various phases of the materials handling problem and their effect on industrial production. Text and pictures cover such subjects as fundamental handling motions, advantages of planned material handling practices. The Yale & Towne Mfg. Co.

For a copy, circle 400 on Post Card

Caster, Wheel Manual—Featured in 192-pp Manual 65 is comprehensive information on company's complete line of casters, wheels, glides, desk shoes and accessories. Illustrated with photos and dimensional drawings and diagrams of the various types of

LESCHEN WIRE PORTER ROPE DIVISION
H. K. PORTER COMPANY, INC.
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Better PIPE TOOLS

CHAIN TONGS

"Reversible", "Standard" and "Ideal" types, in all sizes. *Jaws* are drop forged from special steel, are carefully milled, heat treated, hardened and tested. The *Handles* are forged spring steel. The *Chains* are proof-tested to ⅔ catalog strength (1,200 lb. to 40,000 lb.). "Reversible" Jaws give double jaw life. "Standard" jaws have extra bearing on the handle and forged-in chain guides. The "Ideal" Tongs have V shaped teeth for a sure grip on irregular shapes—fittings, etc.

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Written by engineers and well illustrated, this file contains a wealth of useful information on the application of swivel joints in line design. You'll find facts and figures on torque, geometric characteristics, thrust and radial loads. There's information on how to approach design problems and a quick comparison between swivel joints and other flexible devices. And, you'll find a group of actual installation reports with diagramatic drawings showing how the swivel joints were applied in the system. Be sure you have a copy of "Facts you should know about Swivel Joints" in your possession. Write Chiksan for your file today.

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provides dependable money saving lubrication protection with these performance-proved, patented features:

- ★ Lubricates from 1 CFM to 1200 CFM
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Bulletin #1032 explains operation of Wilkerson patented features. **Bulletin #1028** describes all Lubricators and their Accessories.

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DATA FILE

(Begins on page 250)

casters, and wheels for a variety of applications, manual contains tabulated engineering data. Darnell Corp.

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Self-Dumping Hoppers—Cost-saving advantages of self-dumping steel hoppers for bulk material handling are detailed in Bulletin 265. Photos showing typical handling applications are included. Roura Iron Works, Inc.

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DUST, FUME CONTROL

Dust Control Systems—Bulletin 104, 36-pp on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information on other dust filters. The W. W. Sly Mfg. Co.

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Dust Collectors—Dual-Clone dust collectors with low resistance, high cleaning efficiency and controlled cyclones are detailed in 8-pp Bulletin 573. Performance graphs, typical installations, specifications, supports and drawings are included. The Day Co.

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Freedom from Dust—Bulletin 805, 28 pp, describes a variety of dry collection equipment, showing ways of using cloth filtration and cyclonic equipment for eliminating dust control and air pollution problems. Features descriptive information and specifications on the Multi-Bag filter, Uni-Filter, Glass-Bag Filter and Whirl-Clone, also special collectors and available accessories. Dracco Div., Fuller Co.

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Unit Air Filters—Construction and application of permanent washable unit air filters is fully detailed in 12-pp Bulletin 207. Covers filter maintenance methods and equipment, installation data, and includes charts, and arrestance-resistance curves. American Air Filter Co., Inc.

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ELECTRICAL

Secondary Unit Substations—Detailed information on secondary unit substations—complete and compact load distribution centers for indoor or outdoor application—is supplied in 24-pp Bulletin 3104-1A. Contains data and specifications on a large variety of primary devices, transformers and secondary switch-gear. I-T-E Circuit Breaker Co.

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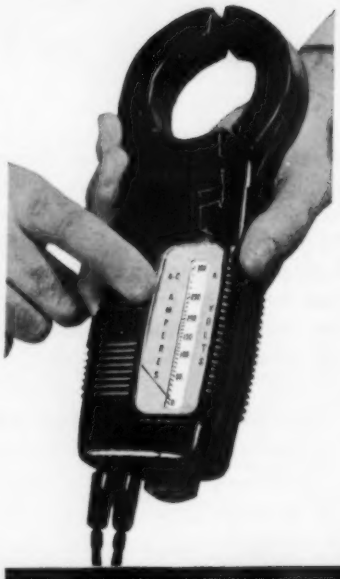
Power Panelboards—Bulletin VBP-470 contains 18 pp of information on features, design and operation of company's fusible Vacu-Break power panelboards. Contains circuit and dimension data, trim data, and sug-

Eight Separate Meters In One



Ideal for general testing and maintenance, the General Electric AK-4 Hook-on volt-ammeter combines eight meters in one.

A twist of the selector switch changes scales; only the range you select shows. You eliminate the confusion and possible misreadings of multiple scales. With its five current and three voltage ranges, it is ideal for troubleshooting, appliance testing, and starting-current checks. Also, the Type AK-5, with four current ranges and three voltage ranges, is suitable for most of these same applications.

Write now for product bulletin, GEA-6292C, to Section 597-08, General Electric Company, Schenectady 5, N. Y.

GENERAL ELECTRIC

For more facts circle 687 on Reply Card

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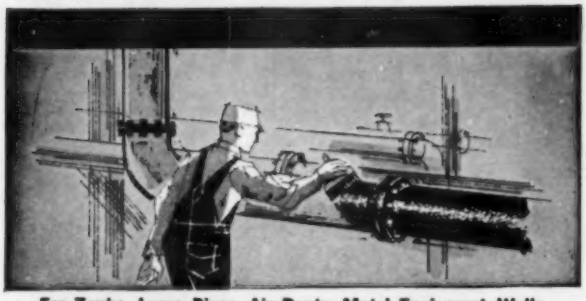

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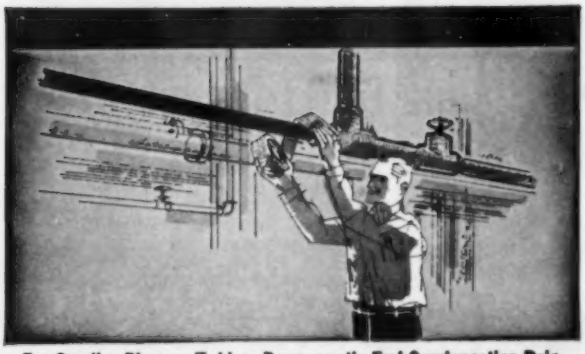
The heavy consistency of NoDrip outlasts many coats of paint or ordinary rust-preventives. Permanently insulates and protects. Applies easily with trowel, brush or special spray. Non-toxic, odorless and non-flammable. Resists acid, alkali, brine solutions or vapors. Available in 1, 5 and 55 gallon drums.



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An easy-to-use, wrap-around pipe covering, perfectly pliable, cork-filled, completely self-adhering. Forms an air-tight, 100% vapor- and moisture-proof jacket. Fits snugly even around tees, unions, angles, valves. Cuts maintenance costs—makes out-of-the-way storage areas useable—ends slip and slide floor hazards. No need for vapor seals, brads, fasteners or tools of any kind.

At all leading hardware, mill supply and plumbing jobbers. For complete information and technical handbook, write

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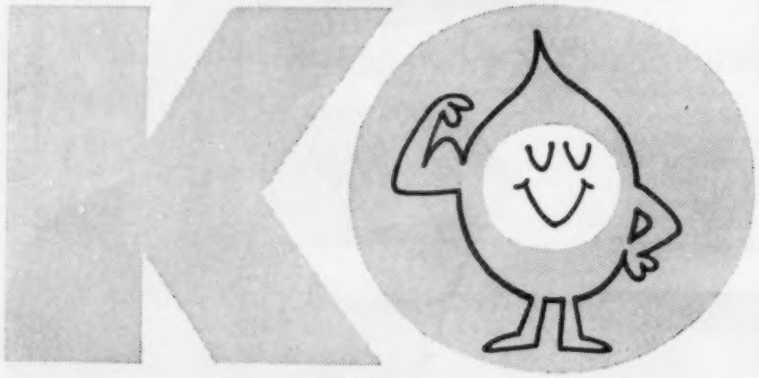

Safety Solvents!

KO9 cleans electric motors *fast*! Just immerse the running motor, remove it in minutes, as clean as new. No work for you...it actually cleans itself.

KO9 also cleans and degreases motors, generators, controllers, switches, panels, instruments, refrigeration lines. You name it...KO9 can clean it!

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TAKE-UP REEL HEADQUARTERS FOR ALL INDUSTRY

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LESCHEN WIRE PORTER ROPE DIVISION

H. K. PORTER COMPANY, INC.

For more facts circle 660 on Reply Card

DATA FILE

(Begins on page 250)

gested specifications on the units. Bulldog Electric Products Div., I-T-E Circuit Breaker Co.

▲ For a copy, circle 409 on Post Card

Electrical Controls—Featured in this 80-pp Bulletin LO-11 is a line of electrical control equipment, including safety switches, service control, load centers, and accessories. Describes design and construction features, and includes detailed selection tables and case dimensions, wire tables. Cutler-Hammer Inc.

▲ For a copy, circle 410 on Post Card

Enclosed Switches—Catalog 83, 22-pp, Catalog 84, 16-pp, and Catalog 101, 24-pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and other types. Micro Switch Div., Minneapolis-Honeywell Regulator Co.

▲ For a copy, circle 411 on Post Card

Safety Switches—Bulletin 502, 10-pp, presents Shutlbrak front-operated, quick-make, quick-brake switches in heavy-duty and standard and light-duty types. Provides ratings and dimensions and discusses features contributing to safer operation, longer service, less maintenance. Frank Adam Electric Co.

▲ For a copy, circle 412 on Post Card

Electrical Equipment—Collected in this bound catalog is a series of bulletins on company's line of electrical equipment, including electric motors, generators, motor-generator sets, switchboards and controls. Cutaway views showing details of design and construction are included. The Ideal Electric & Mfg. Co.

▲ For a copy, circle 413 on Post Card

Molded Case Breakers—Features and advantages of company's molded case circuit breakers are illustrated and described in 28-pp Bulletin GEA-6754. A cutaway view tells the inside story of circuit breaker design, and selection data, including section on determining ampere rating, is furnished. General Electric Co.

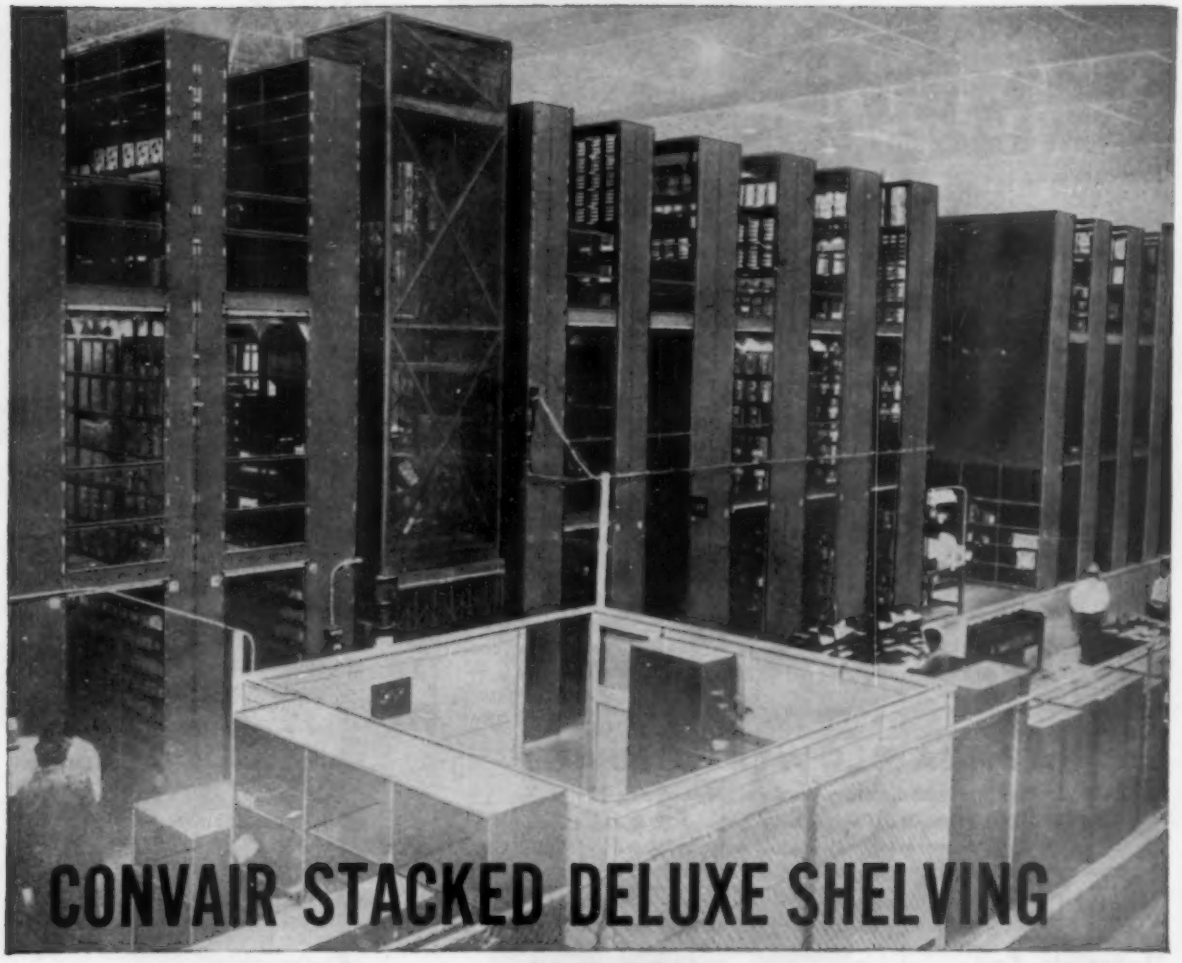
▲ For a copy, circle 414 on Post Card

Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

▲ For a copy, circle 415 on Post Card

Protective Equipment Guide—Form SPD is a 24-pp handbook on selection of protective devices for electric circuits, motors, appliances and apparatus, and is based on 1959 National Electrical Code. Besides providing suggestions on how to select right kind of protections, booklet provides wiring diagrams, motor tables. Bussmann Mfg. Co.

▲ For a copy, circle 416 on Post Card



CONVAIR STACKED DELUXE SHELVING

to save 20,000 square feet of space and $500,000 in parts handling!

Using a three-level "skyscraper" arrangement of Deluxe steel shelving, Convair compressed 34,000 square feet of valuable *storage* space into 14,000 square feet of *floor* space.

The shelving holds an estimated $11,000,000 worth of vital small missile parts previously stored in a number of different buildings. The tremendous savings resulted from (1) reduction of storage floor space required, (2) elimination of fleet of trucks required for parts transfer, and (3) improved efficiencies in finding and handling parts to production.

This huge installation of Deluxe shelving, 642 standard sections bolted together, is completely self supporting.

The Atlas missile builders stacked Deluxe up against all competitive makes, and chose Deluxe shelving because of its greater strength, faster assembly and better appearance at the lowest installed cost.

Write today for more details on this installation and the complete line of Deluxe steel shelving. Deluxe Metal Products Division, Dept. 71-H.

Atlas missile built by Convair

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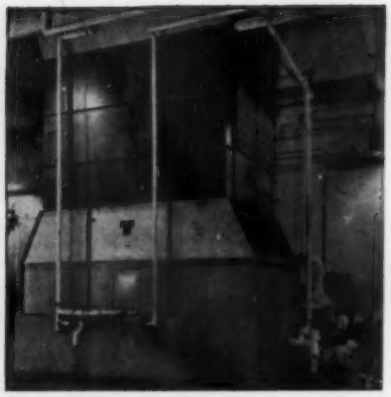

▶ Evaporating a very small amount of water in an air stream you can cool liquids, gases or vapors with atmospheric air, removing heat at the rate of input, controlling temperature precisely. Save 95% of the cost of cooling water; save piping, pumping and power. You quickly recover your equipment cost.

You can cool and hold accurately the temperature of all fluids, condense vapors, cool water, oils, solutions, intermediates, coolants for mechanical, electrical or thermal processes. You have a closed system free from dirt. You have solved all problems of water availability, quality or disposal, maintenance expense is low.

You may apply this to solvent recovery, vacuum systems controlling reactions, condensing distillates, cooling reflux products.

For more information, write for Bulletins 120, 124, 135. Address Dept.

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Niagara District Engineers in Principal Cities of U. S. and Canada

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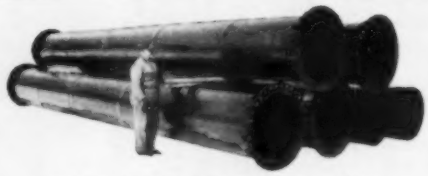

duVerre Stacks & Ductwork Destined for a Leading Chemical Company

PROTECTION FROM CORROSION

du Verre recognizes that many materials play an important part in corrosion control. However, du Verre's reputation is built on the effective, lasting performance of its construction under corrosive conditions where other materials have failed.

du Verre fabricates process equipment such as ducts, stacks, hoods, tanks, covers of Resin Bonded Fiberglass. The prime advantage of du Verre over other materials is homogeneous construction. Unlike coatings and linings, du Verre gives complete corrosion control through and through — both inside and out — even under severe conditions of erosion. du Verre construction is also light in weight. This minimizes shipping and erection costs.

Whatever your corrosion problem, chances are du Verre can solve it. We are equipped for special fabrication to suit your process requirements exactly. Write today for Bulletin No. 101 for complete facts.

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Box 37-F • Arcade, New York

duVerre... First in Quality for Complete Corrosion Control with Reinforced Plastics.

For more facts circle 663 on Reply Card

DATA FILE

(Begins on page 250)

Cathodic Protection Cables—Bulletin RCP 1110 describes cathodic, protection cables for maintenance of underground pipelines and other buried or underwater metallic structures. Typical installation is illustrated, splicing procedure shown. Rome Cable Div., Aluminum Co. of America.

For a copy, circle 417 on Post Card

Safety Mineral Insulated Cable—Bulletin S-2-60, 20-pp, describes cable properties, applications, installation procedure, construction and performance characteristics, electrical and mechanical properties and wiring specifications of mineral insulated cable recommended for hazardous locations. Mineral Insulated Wire Div., General Cable Corp.

For a copy, circle 418 on Post Card

Feeder Busway—Silver-plated copper and aluminum bus bars are featured in 24-pp Catalog 687. Contains detailed engineering and dimensional information on feeder busways and component fittings, as well as voltage drop curves, temperature rise curves, typical busway layout. National Electric Products Co.

For a copy, circle 419 on Post Card

Flexible Electric Conduit—Performance and application data on company's line of flexible plastic covered electrical conduit, Liquatite, are featured in brochure. Electri-Flex Co.

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Portable Test Units—Bulletin SB-RT-1, 48-pp, describes and illustrates the portable test units for protective relays with ratings from 0.4 to 2-kva. Contains information on classification of relay tests; preparation for testing; testing and maintenance programs; tips on selecting relay test units. Multi-Amp Div., Multi-Amp Electronic Corp.

For a copy, circle 421 on Post Card

You'll save time in ordering catalogs by using the Reader Service Cards on page 246. Of course we honor letterhead requests—but it takes us somewhat longer to handle them.

Control Batteries—Twelve pp Bulletin CP-539 describes batteries for control, switchgear and auxiliary power. Construction details are illustrated and described, and specifications are given as well as discharge characteristics curves. C & D Batteries, Inc.

For a copy, circle 422 on Post Card

Battery Technology—Bulletin GB-1896 is a 36-pp handbook of technical instructions and engineering data on the care of motive power storage batteries. Covers all phases of lead acid battery theory, operation and maintenance. Captioned line drawings are included, as well as basic infor-

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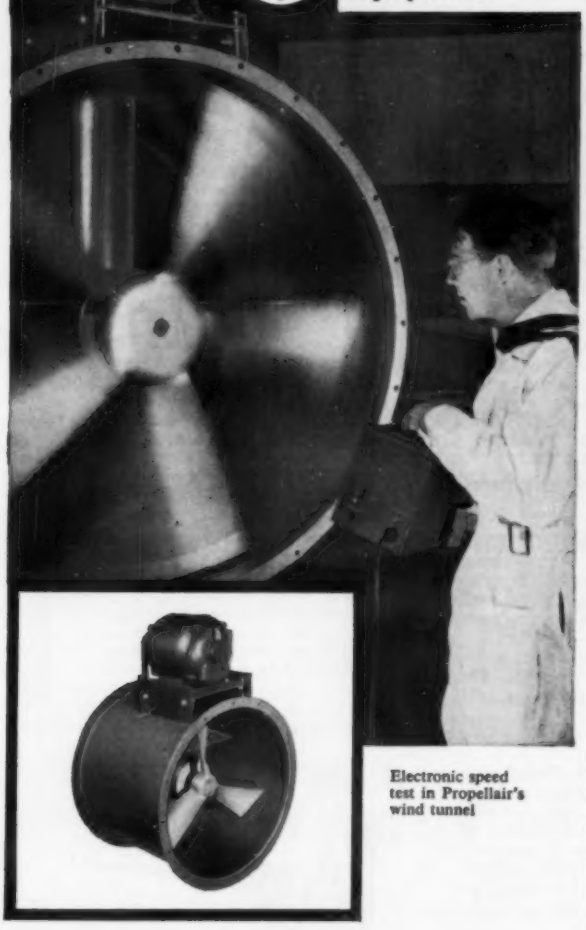
Ventilating Equipment



Electronic speed test in Propellair's wind tunnel

FOR RUGGED DUTY... NEW design axial fans *in sizes up to 60 inches!*

Move corrosive or explosive fumes, extreme heat or high humidity with new PROPELLAIR Type BT belt driven axial fans. They feature heavy 10 and 12-gage drums . . . isolated, air-cooled, protected bearings and belts . . . airfoil propellers cast of hi-strength aluminum-magnesium alloy . . . Robbins & Myers *"All-Weather"* motors for a single nameplate guarantee on the complete unit.

Hi-pressure, big hub propellers are available for those tough applications developing high resistance.

Send today for complete information on this modern, efficient fan. Ask for Bulletin 620—PE

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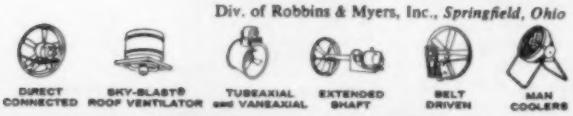
Div. of Robbins & Myers, Inc., *Springfield, Ohio*



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by IDEAL

Over half a century experience in the electric motor field has provided Ideal with the design and engineering background to solve any control problem. Custom-designed to individual specifications with the advantages of a number of exclusive features pioneered and developed by Ideal engineers, Ideal equipment is a sound investment for lasting service and protection.

Typical of hundreds of basically similar weather-protected units in use throughout industry, the above control, installed at a large mid-western oil company, houses two large synchronous motor starters, two smaller induction motor starters, two starters for excitation rectifiers, one 230 to 440 volt auxiliary power transformer, a 440 volt distribution panel and a 110 volt lighting and distribution transformer. For other examples of synchronous, wound rotor and squirrel cage induction starters and controls for indoor and outdoor use, or assistance in selecting the exact control for your requirements, write for Bulletin 601 or contact your nearby IDEAL representative.

The IDEAL ELECTRIC & MANUFACTURING COMPANY

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SANITILE creates gleaming tile-like sanitary walls and ceilings at less than 1/15th the cost of tile. **SANITILE,** brush applied, is the standard of excellence for the chemical and food processing industries throughout the world. *Send for brochure AIA28G.*

The Master Mechanics Co., Cleveland 28, Ohio, or The Master Mechanics Chemicals Co. (Canada) Ltd., Toronto 14, Ont.

THE MASTER MECHANICS COMPANY

For more facts circle 666 on Reply Card

DATA FILE

(Begins on page 250)

mation on specific gravity changes, charging cycles. Gould-National Batteries, Inc.

For a copy, circle 423 on Post Card

Commutator Maintenance—This commutator and slip ring maintenance data file contains information on methods and procedures for more efficient commutation. Individual bulletins cover brushes, sparking, picking, dragging and other troubles, tools. Ideal Industries, Inc.

For a copy, circle 424 on Post Card

Electrical Equipment—Condensed Catalog No. 9 contains 48-pp of descriptive data on company's line of electrical products, including conduit bodies, conduit fittings, connectors, ground fittings and EMT fittings. Dimensional data and features are shown. Gedney Electric Co.

For a copy, circle 425 on Post Card

LIGHTING, COMMUNICATION

Lighting Fixtures—This 12-pp condensed catalog gives a compact presentation of company's fluorescent and Brascolite incandescent luminaries. Data on surface and pendant mounted units, recessed luminaries and Gratelite electric ceilings provided. Edwin F. Guth Co.

For a copy, circle 426 on Post Card

Fixtures for Industry—Details of the CFI—comfort for industry—the uplight fluorescent lighting fixtures are covered in Form OD-1022, 16-pp. Typical installations, comparisons, size and types, and specifications are included. Day-Brite Lighting, Inc.

For a copy, circle 427 on Post Card

Floodlights, Accessories—Pocket-size Bulletin 2714, 184 pp, a miniature catalog, provides information on how to select floodlights, including general purpose, heavy duty, mercury vapor, and special types. Covers lighting for hazardous locations, searchlights, underwater lighting, floodlight poles, accessories. Also gives installation suggestions. Crouse-Hinds Co.

For a copy, circle 428 on Post Card

Lamp Annunciators—Outstanding features, operation, indications, mounting, relay cabinet (types, dimensions) relay plug-ins (operational sequences, types) audible signals (bells, buzzers, horns) and ordering information are covered in this 24-pp Bulletin 6041. Drawings, pictures and engraving data are included. Edwards Co., Inc.

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Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regradless of distance or surrounding noise conditions. Gai-Tronics Corp.

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Signal Equipment—Tips on how to select suitable signals for any specific operations are offered in Bulletin 100. Describes horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts. Federal Sign & Signal Corp.

For a copy, circle 431 on Post Card

PUMPS AND COMPRESSORS

Condensation Pumps—Eight-pp Bulletin 1403 describes company's line of condensation pumps for use in low and medium pressure-heating systems and steam-process equipment. Photos, drawings and other technical data on capacities and dimensions pertaining to construction, application and installation given. Dunham-Bush, Inc.

For a copy, circle 432 on Post Card

Compressed Air Fundamentals—Sixteen-pp Form 1548A is intended to aid in selecting a small, "packaged" air compressor. Discusses compressed air, how it is compressed, single- and two-stage compressors, piston displacement, control used, etc. Includes information on compressor oils, pipe sizes, wire sizes, terminology, as well as data on air requirements for various pneumatic equipment. Ingersoll-Rand Co.

For a copy, circle 433 on Post Card

Unit-Type Compressors—Again available to power engineers is 12-pp Bulletin SG-2 on unit type compressors. Illustrated in color, this bulletin uses photos and cutaways to describe single- and two-stage compressors from ½ to 15 hp, available pressures

LESCHEN WIRE PORTER ROPE DIVISION

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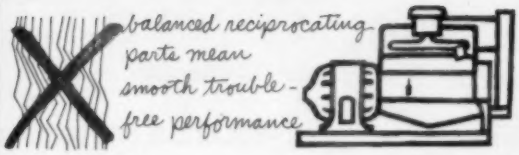
For more facts circle 671 on Reply Card

6 WAYS YOU CUT COSTS WITH SCHRAMM COMPRESSORS

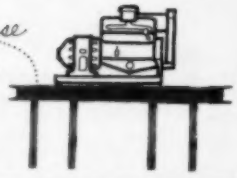
1 there's no vibration!

balanced reciprocating parts mean smooth trouble-free performance



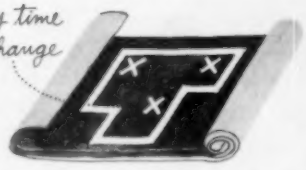
2 you don't have to reinforce floors

any space serves as base
no special foundation
just bolt it down



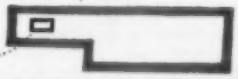
3 you can move compressor any time

change location any time production plans change



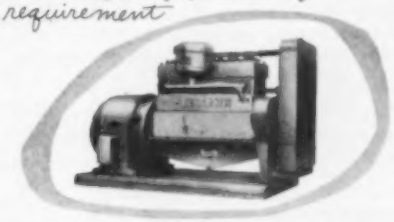
4 Schramm compressors are compact

integral cooling system saves space
put unit overhead or in odd corners



5 you get a complete package

one unit has everything you need for any air requirement



6 you eliminate central compressors

unit system allows you to buy only the Schramm compressor you need, add as requirements grow

Schramm AIR COMPRESSORS

Schramm Stationary Compressors are electric motor or V-belt driven . . . 50 to 600 cfm. Write today for Bulletin SSB-59.

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For more facts circle 668 on Reply Card

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NEW

Oakite VisStrip®

For stripping paint from the vertical surfaces of metal panels, walls, cabinets . . . there's nothing quite like the "grip-and-strip" action of new Oakite VisStrip.

Oakite VisStrip has just the right viscosity to cling tenaciously to vertical and underside surfaces . . . to loosen the grip of such resistant finishes as epoxies, acrylics, vinyls, polyesters . . . to set these finishes up for easy removal by pressure rinse.

Oakite VisStrip covers quickly, smoothly with brush or swab. High viscosity is maintained over long periods of time. Service Report 55A gives complete details. Write Oakite Products, Inc., 31C Rector Street, New York 6, N. Y.

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For more facts circle 670 on Reply Card

DATA FILE

(Begins on page 250)

from 80 to 250 psi. Specifications list cfm displacements, pressures, weights, dimensions and rpm. Le Roi Div., Westinghouse Air Brake Co.

▲ For a copy, circle 434 on Post Card

Industrial Compressors—Oil-free heavy-duty industrial compressors are illustrated and described in 12-pp Bulletin A-92. Cutaway views show details of internal design and construction, and bulletin includes photos of typical installations. Joy Mfg. Co.

▲ For a copy, circle 435 on Post Card

Stationary Compressors—Sixteen-pp Catalog 5910 describes features and advantages of a line of stationary air compressors designed for a variety of industrial needs. Tables of weights, code words, and dimensions are included, as well as schematic diagrams. Schramm, Inc.

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Heavy Duty Compressor—Eight-pp Bulletin 350 describes and illustrates a horizontal, water-cooled, single-stage, heavy duty compressor designed to fit most compressed air applications. Photos, line drawings and cross-sectional views illustrate construction. Pennsylvania Pump & Compressor Co.

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Water-Cooled Compressors—Featured in 12-pp Bulletin WB10 are two-stage water-cooled air compressors designed to meet the demand for small machines having efficiencies comparable to those of large two-stage horizontal compressors. Cutaway views showing component features included. Gardner-Denver Co.

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PACKINGS, SEALS

Compression Packings—Featured in this 22-pp catalog is a line of compression packings, including both sheet and rod seal types. Describes packing materials and includes sections on recommended packings for various services, including air and inert gases, pharmaceuticals, foodstuffs and beverages, paper and textile processing, water, petroleum, and acid service, alkalis and steam service, others. E. F. Houghton & Co.

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Mechanical Seal—Performance and design features of Mechanipak PK mechanical seals for a variety of operating conditions are detailed in 8-pp Bulletin AD-150. Cutaway views, diagrams and tables of dimensional data included. Garlock, Inc.

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Teflon Products—Three bulletins present this company's Teflon packings, gaskets, special parts and stock. Bulletin CP552 describes Chempro lines of Teflon ring packings, Teflon impregnated asbestos packing, V-type packing and Teflon seal cage—for use with acids and strong chemicals. Bulletin CP553 covers Teflon jacket gaskets, solid ring gaskets, expansion joints and special gaskets. Bulletin CP554 illustrates special parts. Chemical & Power Products, Inc.

▲ For a copy, circle 441 on Post Card

BOILERS, BURNERS

Hot Water Boilers—Catalog HCC-2, 20-pp describes and illustrates design, construction, advantages and economies of company's controlled circulation hot water boiler for supplying high pressure, high temperature water for heating systems and process use. Combustion Engineering, Inc.

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Hot Water Boilers—Featured in this Product Bulletin AD-183 is a line of hot water boilers with forced thermal circulation and high velocity tempering flow. Internal flow pattern is shown on cutaway, and design and test data given. Cleaver-Brooks Co.

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Steam Generators—Advantages of company's steam generators designed to adjust to actual production needs are detailed in this 6-pp Product Bulletin C-731. Schematic diagram showing operating details is included. Clayton Mfg. Co.

▲ For a copy, circle 445 on Post Card

Packaged Steam Generators—Bulletin B-3255 contains detailed information on shop-assembled steam generators in capacities from 10,000 to 60,000 lb of steam per hour. Advantages of construction, performance and maintenance are illustrated. The Titusville Iron Works Co.

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Bent Tube Boilers—Design and operation features of company's bent tube boilers for power, processing or heating are detailed in 22-pp Bulletin VF-VS-2. Boiler sections of typical installations and principal data on each are included. Henry Vogt Machine Co., Inc.

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Steam Atomization—Bulletin 1252 contains detailed information on a steam-atomizing burner system designed for burning low-cost heavy oils. Advantages are explained and operation of unit described. Orr & Sembower, Inc.

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Fuel Burning Equipment—Comprehensive Catalog 6260 covers oil burners, gas burners, dual-fuel burners for gas and oil, forced draft package units, boiler-burners units, coal stokers, combustion control panels and the SelecTemp steam heating system. One section discusses selection of fuel and types of draft available. Iron Fireman Mfg. Co.

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INSULATION, PROTECTION

Pipe Insulation—Properties and advantages of fiber glass pipe insulation are detailed in Bulletin F-110. Tables list dimensional and packing data, and specifications are given. Pittsburgh Plate Glass Co.

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Insulation Coating—This 32-pp illustrated handbook, Form L-17, presents the advantages of company's No-Drip insulation coating for preventing condensation drip from metal, con-

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PLANT ENGINEER

Small Eastern Pennsylvania chemical plant has staff opening for plant engineer. Prefer man with mechanical engineering degree and at least five years practical experience. This man should be familiar with construction trades, process industry equipment and engineering department systems, including drawings, specifications, purchasing and supervision. This is a young, growing organization with opportunity for advancement. Reply Box 2071 giving qualifications and interests. Plant Engineering, 308 E. James Street, Barrington, Ill.

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Maintenance Engineer to supervise the maintenance department of a large bakery in the New York City area. Degree in mechanical engineering desirable but not necessary. At least five years of successful supervisory maintenance experience, knowledge of principles of preventative maintenance, and scheduling ability are necessary. Address Box 2072, Plant Engineering, 308 East James St., Barrington, Ill.

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FOR SALE:

1 Farrar & Trefts 2S1150 Scotch Power Boiler, 1522 sq. ft. heating surface, 150 lb. steam design pressure complete with Dayton Automatic Stoker #10, controls, pumps, deaerating heater and water softener. Complete details on request. National Gypsum Company, Purchasing Department, Buffalo 2, New York.

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For more facts circle 675 on Reply Card

DATA FILE

(Begins on page 250)

crete, brick, wood, plaster, or composition surfaces. Mortell Co.

For a copy, circle 452 on Post Card

Piping Insulation—Seven-pp Bulletin SO 1054 features a snap-on, one-piece molded pipe insulation of fine-glass fibers for hot or cold piping. Gustin-Bacon Mfg. Co.

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OTHER EQUIPMENT

Industrial Stack—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces, etc. VanPacker Co., Div., The Flintkote Co.

For a copy, circle 455 on Post Card

Elastomer Coated Fabrics—Detailed information on synthetic elastomer coated fabrics is presented in this 12-pp bulletin. Physical properties and tests of the various synethic fabrics, uses, specifications are covered. E. I. du Pont de Nemours & Co., Inc.

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How Corrosion Attacks—This water conditioning data sheet explains how and why boiler, cooling and process water systems are constantly plagued by corrosion. Discusses such factors as pH, dissolved solids, temperature, flow rate, dissimilar metals, carbon dioxide. Betz Laboratories, Inc.

For a copy, circle 457 on Post Card

For Cleaner Furnace—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recent pamphlet. Oxi-Kor Corp.

For a copy, circle 458 on Post Card

Cathodic Protection System—Causes of corrosion and principles of cathodic protection are detailed in this 12-pp bulletin. Covers cathodic protection for pipe lines, water works equipment. The Harco Corp.

For a copy, circle 459 on Post Card

Air Equipment—Catalog 100, 112-pp, in six sections describes stationary and rotating air cylinders and air-operated vises, heavy-duty, mill-type air cylinders, air-draulic cylinders, air control valves and accessories, cylinders for air or oil service, and ultra-mation cylinder for air or oil service. Dimensions given. Logansport Machine Co., Inc.

For a copy, circle 460 on Post Card

Hose, Belting and Packing—Hoses, Powerflex, Powerflex ORHS and Double V belts and transmission, conveyor and elevator belting, friction material and sheet rubber are illustrated and described in Form 3665, 12-pp. Detailed specifications and construction features included. Thermoid Div., H. K. Porter Co., Inc.

For a copy, circle 461 on Post Card

Hydraulic Press Brakes—Features and applications of company's hydraulic press brakes designed for jobbing shops as well as for many mass-production operations are detailed in 8-pp Bulletin 2024-B. Component parts are illustrated and described. The Cleveland Crane & Engineering Co.

For a copy, circle 462 on Post Card

Industrial Equipment—Featured in this 5-pp Bulletin is a line of equipment manufactured by this company, including such items as air release, can filters, capacitors, circulating lubrication systems, rate of flow controllers, dispensing outfits, filters, indicators, lubricating units, meters, oilers, pumps, valves. Bowser, Inc.

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Corrosion Control—Process Bulletin B6 discusses causes of condensate system corrosion and methods of corrosion control in steam condensate systems. Nalco Chemical Co.

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Adhesive Bonding of Aluminum—Principles and procedures involved in the adhesive bonding of aluminum are explained in this 20-pp bulletin. Covers design of joints, types of adhesives for aluminum, processing of adhesive joints, typical applications, and includes tabular data and illustrations. Reynolds Metals Co.

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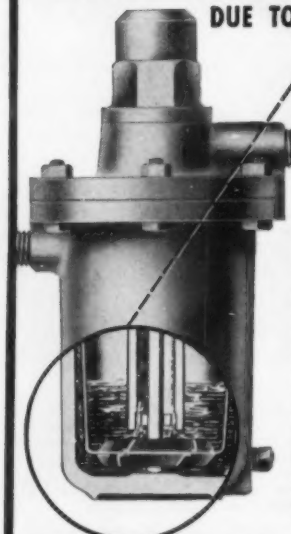
TRERICE Steam Traps

NEVER LEAK

DUE TO WIRE-DRAWING!

Patented Propeller Rotates Stainless Steel Valve—Assures Long Life



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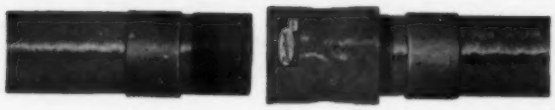

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Can bottom is raised 5/8" up into can body to provide protective rim around base of can.

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Provide a durable double barrier. If inner wall is damaged, outer wall provides protection until unit is replaced.

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Spout is "clinched" and soldered to top section of the can to withstand strain of repeated opening and closing.

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Spring operated cap has ball and socket joint assembly to assure uniform, self-adjusting, liquid-tight seal of special leak-resistant gasket.

6. QUICK-ACTING DISPENSING VALVE
Convenient hand operation gives fast, positive control while pouring. Instantly shuts when pressure is released.

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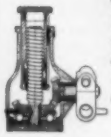
THE WORLD'S MOST COMPLETE LINE!

SIMPLEX SCREW JACKS

SCREW JACKS 4-WAY HEAD—19 MODELS
10 to 24 tons capacity.
Ball bearing, Malleable Housing, Safety peep hole.

RATCHET HEAD—10 MODELS
20 to 24 tons capacity for close-quarter operation.

PLANER JACKS —5 MODELS
2 to 8 tons capacity. 2¾" to 7" high. 1" to 4½" Lift. Swivel head & lock screw.



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8 Models, three with aluminum alloy housings. 15 to 50 tons capacity.

TRAVERSING BASES and TRAVERSING BASE SCREW JACKS
7 Models—10 to 50 tons cap. Vertical & Horizontal travel.

REEL JACKS—3 MODELS
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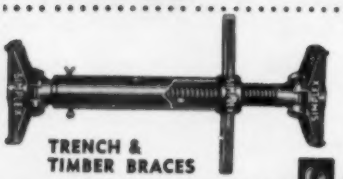

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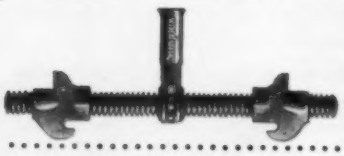

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12 Models
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Look for further information on Hydraulic and Lever Jacks in other advertisements.

Write for Catalog: Mechanical 60

Other screw types: Steamboat Ratchets & Load Binders, MINE ROOF AND TIMBER JACKS, Rail Puller & Expander, and Gear & Wheel Pullers, Bumper Jacks.

TEMPLETON, KENLY & CO.
2561 Gardner Road
Broadview, Illinois

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DATA FILE

(Begins on page 250)

Product Directory—Product Directory G-103 covers company's divisions and products. Products are divided into major sub-groups—chain link fence, chemicals and coke, springs, belts, wire, wire cloth, etc. Brand names are given, as well as applicable reference literature. The Colorado Fuel and Iron Corp.

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Industrial Equipment—Catalog A-660, 12-pp, discusses finishing systems—specifically—spray, dip or flow coatings, cleaning, pickling, rust-proofing, hydro-filter spray booths, dip and flow coaters, drying and baking ovens, hydro-foam dust collectors and fog filters. The R. C. Mahon Co.

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Product Guide—This 26-pp booklet is designed to show the wide range of products manufactured by the Company. It contains an alphabetical listing of the products, with reference to engineering literature available for further information. Allis-Chalmers Mfg. Co.

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Compressed Air Products—Color-coded for easy product identification, 24-pp Catalog 158 contains comprehensive information on company's compressed air products, including filters regulators, lubricators, drains and accessories. Details specifications. Wilkerson Corp.

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Corrosion Resistant Products—Featured in this 8-pp bulletin are resin bonded fiber glass products for the chemical industry, including ducts, stacks, hoods, fans, tanks, trays, ejectors, hoppers and covers. Typical applications are illustrated and specifications and dimensional data included. du Verre Inc.

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THEY ARE SELF-TUNING

For maximum performance, a horn must be tuned to correct electric and mechanical balance. For reliability, the sound producing parts must maintain a constant electro-magnetic relationship.

Federal Vibratones are the only self-tuning, self-compensating horns. Even eventual wear from continuous duty doesn't destroy tone, accelerate heat rise, and produce burnout.

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Aerovent Fan Co., The 258
Airkem, Inc. 243
Alan Wood Steel Co. 196
Allis-Chalmers Mfg. Co. 233
Aluminum Company of America 155
Amercoat Corporation 275
American Bridge Division 96-97
American Chain & Cable Co.
Wright Hoist Division 205
American Hoist & Derrick Co. 62-63
American Standard Industrial Div. ..... 37 thru 40
Anchor Post Products, Inc. 52
Armstrong Bros. Tool Co. 262
Armstrong Machine Works 212

Ballymore Company 198
Bassick Company 202
Bettinger Corporation 182
Betz Laboratories, Inc. 14-15
Black & Decker Mfg. Co. 193, 194, 271
Blaw-Knox Company 70
Bowser, Inc. 274
Buffalo Forge Company 77
Bulldog Electric Products Div.
ITE Circuit Breaker Co. 167
Bussmann Mfg. Company 42-43
Butler Mfg. Company 80, 256

C & D Batteries, Inc. 98
Ceilcote Company 54
Celanese Corp. of America 181
Chemical & Power Products, Inc. 34
Chemtrol 222
Chiksan Company 263
Clarage Fan Company 172
Clayton Mfg. Company 5
Cleaver-Brooks Company 228
Cleveland Tramrail Division
Cleveland Crane & Engr. Co. 226
Colorado Fuel & Iron Corp. 251
Crane Company 177
Crouse-Hinds Company 45
Curtiss Wright Corporation 169
Cutler-Hammer, Inc. 82-83

Darnell Corporation, Ltd. 273
Day Company 68
Day-Brite Lighting, Inc. 164-165
Douglas Fir Plywood Assn. 93
Dracco Div. of Fuller Co. 188
Dravo Corporation 262
Duff-Norton Company 50
Dunham-Bush, Inc. 190
Du Pont de Nemours & Co., E. I. 71, 204, 237
Duriron Company 199
DuVerre, Inc. 268

Erie City Iron Works 259
Esso Standard,
Div. of Humble Oil & Refining Co. 86

Falk Corporation 35
Federal Pacific Electric Co. 184-185
Federal Sign & Signal Corp. 276
Flintkote Company 176, 275
Fluor Products Company 213
Fuller Company 60

Gai-Tronics Corporation 36
Garlock, Inc. 21
Gates Rubber Company 49, 73
Gedney Electric Co. 244
General Cable Corp. 170-171, 231
General Electric Company
Apparatus Division 10-11, 174-175, 209, 254-255, 264
Circuit Protective Devices 249
Lamp Division 219
Gleason Reel Corp. 266
Globe Company
Products Division 218
Goodyear Tire & Rubber Co., Inc. 1
Gould-National Batteries, Inc. 163
Graybar Electric Company 3
Gulf Oil Corporation 78-79
Gustin-Bacon Mfg. Co. 53
Guth Co., Edwin F. 24

Hansen Mfg. Company 241
Harco Corporation 273
Harry Glass Co., H. A. 224
Hartzell Propeller Fan Co. 278
Hooker Chemical Corp. 220

Ideal Electric & Mfg. Co. 269
Ideal Industries, Inc. 242
Imperial Brass Mfg. Co. 22-23
Industrial Brownhoist Corp. 272
Ingersoll-Rand Company 207
International Nickel Co., Inc. 257
Iron Fireman Mfg. Co. 81
ITE Circuit Breaker Co. 32-33, 192

Jenkins Bros. 195
Johns-Manville Corp. 84-85, 200
Joy Manufacturing Company 27

KOR Corporation 266

Le Roi Division
Westinghouse Air Brake Co. 223
Leschen Wire Rope Div.
H. K. Porter Co., Inc. 256, 262, 266, 270
Link-Belt Company 95
Logansport Machine Co., Inc. 236
Louis-Allis Company 8-9
Lyon Metal Products, Inc. 61

MacWhyte Company 211
Mahon Company, The R. C. 230
Master Lock Company 266
Master Mechanics Company 270
Micro Switch
Div. of Minneapolis-Honeywell 178-179
Mine & Smelter Supply Co. 240
Mobil Oil Company 57, 58-59
Modine Mfg. Company 94
Mortell Company 265

Nalco Chemical Company 229
National Heater Co. 273
Niagara Blower Company 268
Norgren Company, C. A. 183

Oakite Products, Inc. 271
Orr & Sembower, Inc. 203
Otis Elevator Company 6-7

Page Fence Association 260
Pass & Seymour, Inc. 235
Pennsylvania Pump & Compressor 48
Pittsburgh Corning Corp. 159, 160-161
Pittsburgh Plate Glass Co. 239
Porter Co., Inc., H. K.
Leschen Wire Rope Div. 256, 262, 266, 270
Powers Regulator Company 67
Propellair Div.
Robbins & Myers, Inc. 269
Protectoseal Company 275

Ramset Fastening System 225
Reynolds Metals Company 217
Reznor Mfg. Company 227
Richards-Wilcox Mfg. Co. 180
Ridge Tool Company 265
RLM Standards Institute, Inc. 261
Robbins & Myers, Inc.
Hoist & Crane Div. 74
Pump Division 75
Robertshaw-Fulton Controls 187
Rockwell Company, W. S. 282
Rohm & Haas Company 41, 253
Rome Cable Corporation 146-147
Roura Iron Works, Inc. 260
Royal Metal Mfg. Co. 267
Ryerson & Sons, Inc., Joseph T. 65

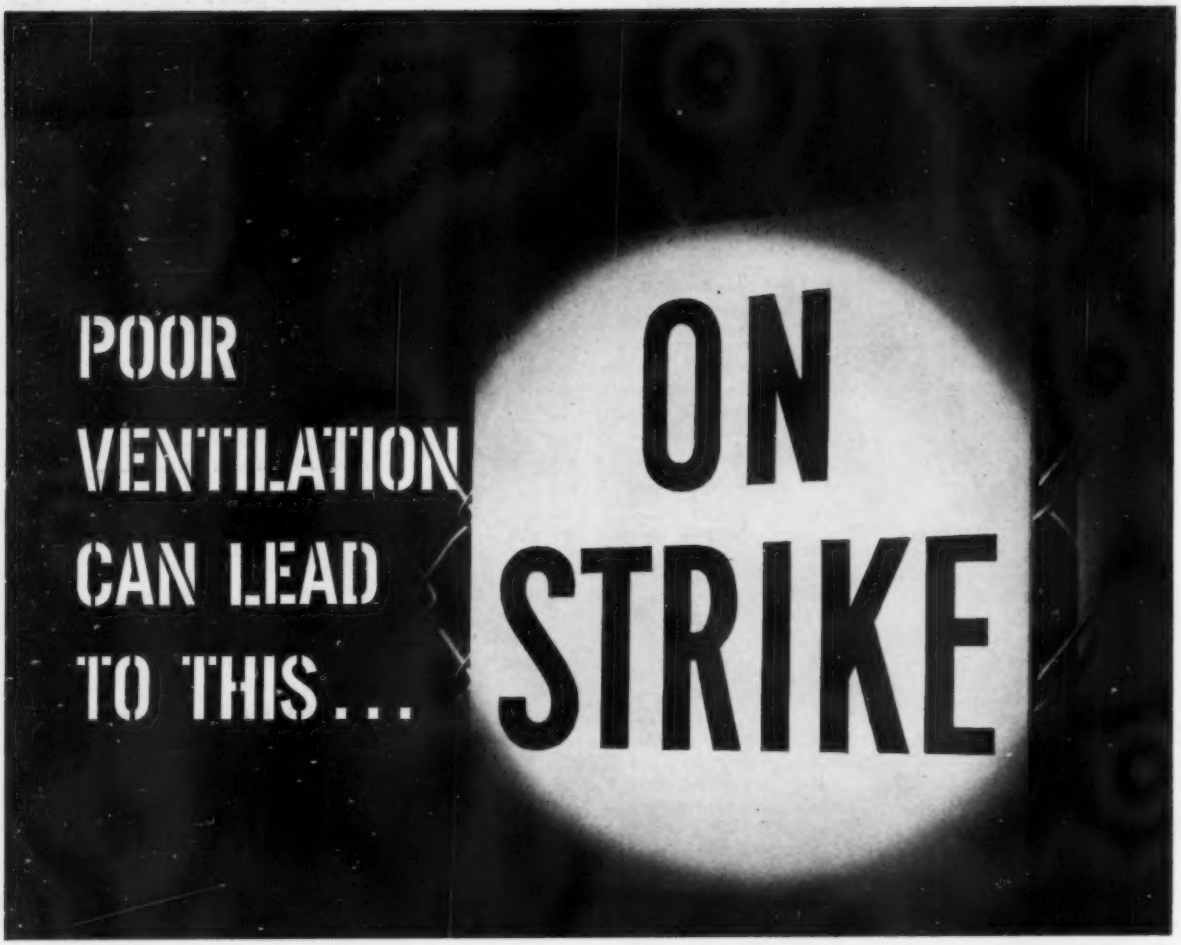
Sarco Company, Inc. 214-215
Schramm, Inc. 271
Sexauer Mfg. Co., J. A. 242
Shell Oil Company 191
SKF Industries 186
Skil Corporation 221
Sly Mfg. Co., W. W. 234
Smith & Co., Inc., Elwin G. 173
Snap-on Tools Corp. 72
Square D Company ..... 2nd Cover, 201, 3rd Cover,
Standard Electric Time Co. 216
Stratos Div.
Fairchild Engine & Airplane Corp. 240
Stromberg-Carlson Co. 51
Strong, Carlisle & Hammond 16
Sun Oil Company 47
Swartwout Fabricators, Inc. 76

Templeton, Kenly & Co. 276
Texaco, Inc. ..... 17 thru 20
Thomas Flexible Coupling Co. 4
Trerice Company, H. D. 274
Tube Turns Div. of Chemetron Corp. 30-31

Union Wire Rope Corp. 56
U. S. Electrical Motors ..... Back Cover

Vogt Machine Co., Henry 69

Weatherhead Company 197
Westinghouse Electric Corp. ..... 12-13, 28-29, 89 thru 92, 151, 152-153, 187
Wheeling Corrugating Co. 55
Wickwire Spencer Steel Div. of CF&I 251
Wilkerson Corporation 264
Wright Hoist Division
American Chain & Cable Co. 205



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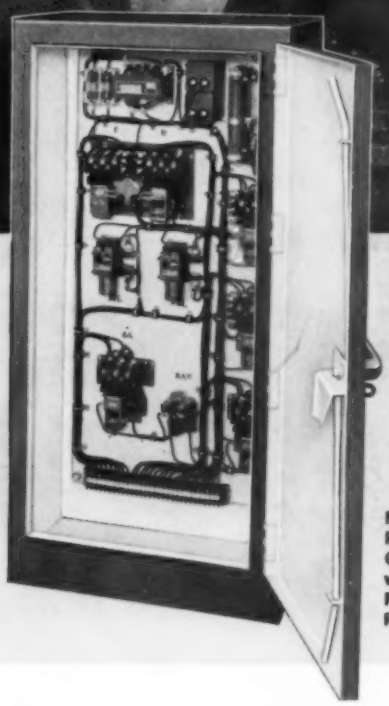
EC&M

"VL" AC CRANE CONTROL

for light industrial* crane service



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*NEMA Service Classification II applications

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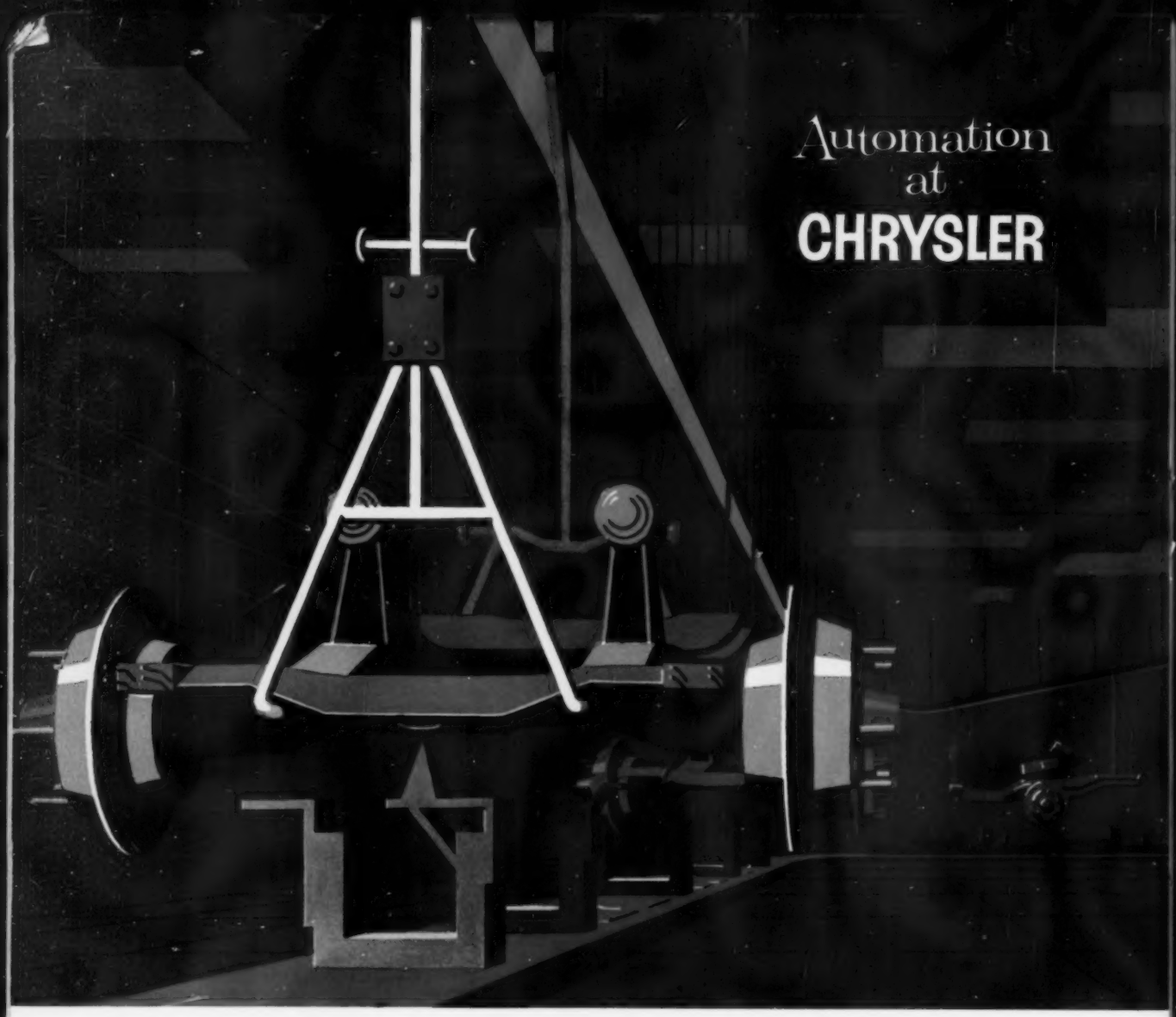

VARIDYNE a/c drive system synchronizes assembly conveyors

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